ISSUE 164 SEPTEMBER 2005

Better Homes and Gardens®

WOOD®

The Shop-Proven Woodworking Magazine

3-piece modular home office

(check it out on page 46)

More Great Projects:

- Sandpaper organizer page 64
- Nesting serving trays page 88
- Salt and Pepper mills page 41

Hang doors that fit perfectly!
(see page 68)

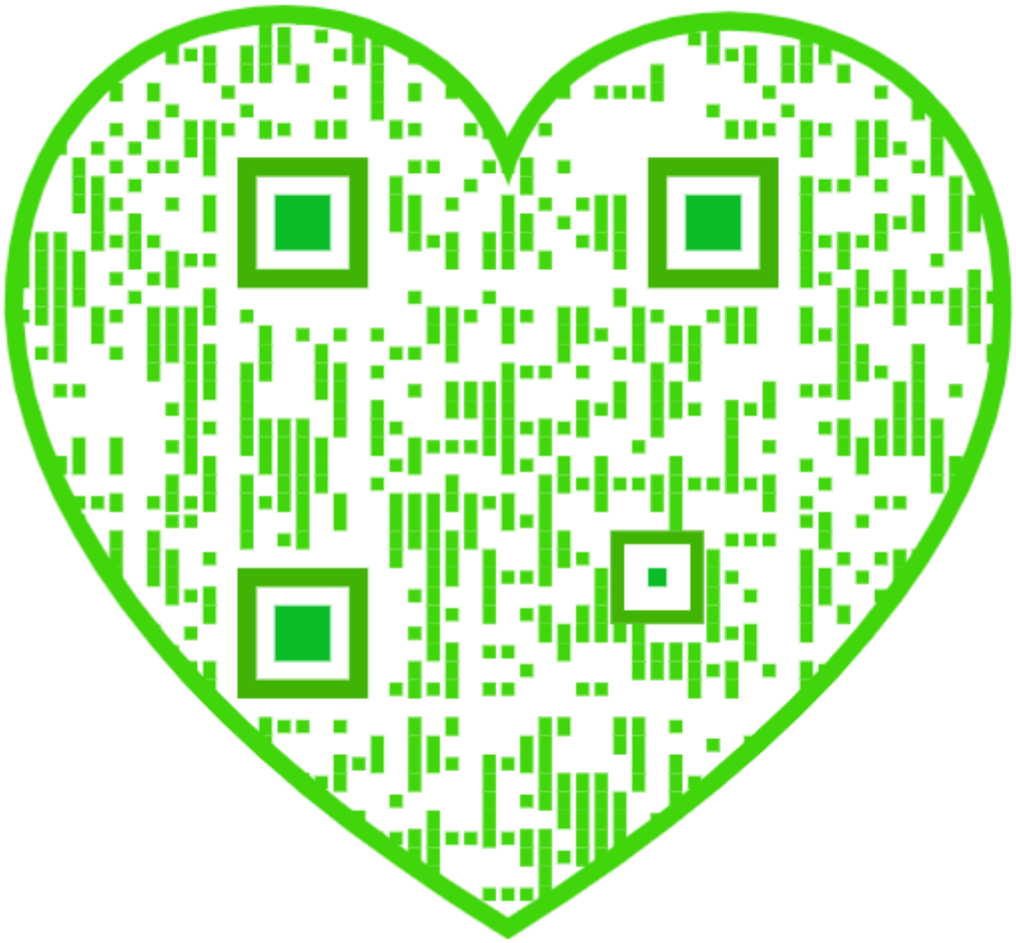
2 simple ways to make raised panels

Catch the latest in computer desk hardware!
(see page 32)

12 must-have upgrades trick out your router table

7 *Keys to Successful Finishing*

Unbiased ratings on **11** Monster Routers



WOOD®
September, Issue 164

PROJECTS

12 workshop tape dispenser
30 kids' building blocks
41 turned salt and pepper mills
46 home office desk system
Assemble a sectional suited to your needs by mixing and matching these three designs: a **corner desk**, **straight desk**, and **up-top cabinet**.
61 raised-panel tablesaw sled
64 store-all sandpaper cabinet
88 nesting serving trays
96 simple laminate press

TECHNIQUES

14 give laminate tops a wooden edge
16 make router miscuts disappear
26 apply super-colorful dyes
36 the locked-tenon-and-socket joint
44 seven keys to successful finishing
60 two easy ways to make raised panels
68 mount cabinet doors for a perfect fit
80 tips from a premier box maker
86 success strategies for figured wood
98 understanding guide bushings

TOOLS & MATERIALS

32 computer desk hardware solutions
38 wise buys in pneumatic pinners
74 shop-tested monster routers
Eleven beefy models go head-to-head for top honors. See which one is right for you.
92 twelve great router-table upgrades
100 three shop-proven products

DEPARTMENTS

6 editor's angle
10 sounding board
18 ask *WOOD*
22 shop tips
112 what's ahead

WOOD MAGAZINE SHOP TESTED APPROVED®

This seal is your assurance that we build every project, verify every fact, and test every reviewed tool in our workshop to guarantee your success and complete satisfaction.

Build one or more of these modular projects for the home office you always wanted.

Better Homes and Gardens®
WOOD®

September 2005 **Vol. 22, No. 4** **Issue No. 164**

Jim recently reorganized his home shop. Here's his mitersaw stand and multi-purpose work area.

EDITOR-IN-CHIEF
BILL KRIER

Executive Editor **JIM HARROLD**
Managing Editor **MARLEN KEMMET**
Senior Design Editor **KEVIN BOYLE**
Tools Editor **DAVE CAMPBELL**
Techniques Editor **BOB WILSON**
Techniques Editor **PAT LOWRY**
Projects Editor **OWEN DUVALL**
Projects Editor **JAN SVEC**
Design Editor **JEFF MERTZ**
Master Craftsman **CHUCK HEDLUND**

Art Director **KARL EHLERS**
Associate Art Director **GREG SELLERS**
Assistant Art Director **CHERYL A. CIBULA**

Production/Office Manager **MARGARET CLOSNER**
Administrative Assistant **SHERYL MUNYON**

Photographers
MARTY BALDWIN, SCOTT LITTLE, BLAINE MOATS, JAY WILDE

Illustrators
TIM CAHILL, LORNA JOHNSON, ROXANNE LeMOINE

Technical Consultants
DEAN FIENE, JEFF HALL

Contributing Craftsman
JIM HEAVEY

Proofreaders
BARBARA KLEIN, IRA LACHER, JIM SANDERS

CUSTOMER SERVICE: 800/374-9663
For more ways to reach us about specific matters, see *page 10.*

Publisher **MARK HAGEN**

ADVERTISING
CHICAGO OFFICE: 333 N. Michigan Ave., Suite 1500, Chicago, IL 60601
Phone: 312/853-2890 Fax: 312/580-7906
Sales and Marketing Assistant **GAYLE CHEJN**
Sales and Marketing Assistant **LISA GREENWOOD**
Account Executive **JACK A. CHRISTIANSEN**
Direct Response Manager **CAROLYN DAKIS**
Direct Response Sales Representative **SANDY ROBINSON**
NEW YORK: Phone: 212/551-7043 Fax: 212/551-7192
Account Executive **PATRICK R. TOMLINSON, SR.**
DETROIT: RPM Associates,
29350 Southfield Road, Suite 31, Southfield, MI 48076
Phone: 248/557-7490 Fax: 248/557-7499
ATLANTA: Navigate Media,
1875 Old Alabama Road, Suite 1320, Roswell, GA 30076
Phone: 678/507-0110 Fax: 678/507-0118

Director, Corporate Sales **RICH BERENSON**
Director, Corporate Research **BRITTA C. WARE**
Business Manager **JOEL ETIENNE**
Consumer Marketing Director **ROBIN HUTCHINSON**
Consumer Marketing Manager **LESLIE SHAEFFER**
Associate Director of Marketing-Newsstand **TOM DEERING**
Advertising Operations Manager **PAT HENDERSHOTT**
Production Manager **STEVE KRIDER**

Executive Vice President **BOB MATE**

MEREDITH PUBLISHING GROUP
President **JACK GRIFFIN**
General Manager **TOM HARTY**
Brand Licensing/Operations **DOUG OLSON**
Consumer Marketing/Finance **KARLA JEFFRIES**
Manufacturing **BRUCE HESTON**
Creative Services **ELLEN DELATHOUDER**

Meredith CORPORATION

Chairman and Chief Executive Officer **WILLIAM T. KERR**
President and Chief Operating Officer **STEPHEN M. LACY**

In Memoriam — E.T. Meredith III (1933–2003)

Mark made this heirloom hope chest (issue 142) for his daughter's college graduation. Congrats Katie!

©Copyright Meredith Corporation 2005 All rights reserved. Printed in the U.S.A.

Cruisin' for free shop advice

It is true that many of the best things in life are free. If you need evidence of that, just visit the *WOOD*® magazine Web site.

I'm a big fan of, and visitor to, woodmagazine.com, and not just because I work here. The site happens to be the best place—on the Web or in person—to get immediate help with a woodworking dilemma, locate a unique woodworking plan, or decide on the best tool. If you haven't had the chance to check it out recently, you owe it to yourself to see firsthand what a valuable resource it is. Here are the parts of the site I consider must-visits:

■ **Index to past articles.** Although we used to print an annual index in the magazine, we've switched to providing the index on our Web site. And for good reason—there's simply no better way to provide this service to you. No longer do you have to hunt through a number of paper indexes to find the right article. Simply type in a keyword and click. The online index instantly sifts through all issues from issue 1 through today. Our index software cross-references articles with many more keywords than a paper index, ensuring your successful search.

■ **Articles and plans.** You can gain access to many past *WOOD* magazine articles and project plans even if you don't have a complete collection of past issues. Order online and we'll provide you a downloadable article or mailed copy for a modest fee. You'll also find a section of free downloadable articles. (Tip: Check back often because a new free plan goes on the site every month.)

■ **Newsletter sign-up.** Find out about recent woodworking happenings and special offers by receiving our free e-mailed newsletter every 2–4 weeks.

Managing Editor Marlen Kemmet keeps our Web site a happening place for woodworkers of all skill levels.

■ **Woodworking forums.** Does the idea of having hundreds of experienced woodworkers at the ready to answer your questions sound appealing? It happens every day at woodmagazine.com.

■ **Classifieds.** Buy and sell tools using this free and effective service.

■ **Tip of the Day.** Have I mentioned that most of what you'll find at our Web site is free? Here's yet another one. Just sign up and we'll drop a new shop tip in your e-mail every day.

■ **Tool giveaway.** Every month one of our site visitors receives a valuable woodworking tool just for registering. Who knows, you might get lucky!

See you online,

Bill Krier

sounding board

Our bulletin board for letters, comments, and timely updates

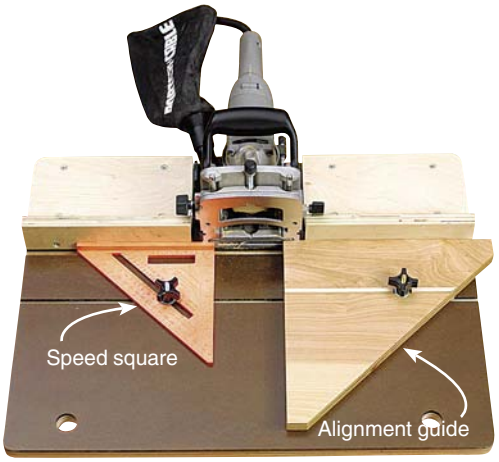
Speed square complements the biscuit-joiner jig

I was so excited about the biscuit-joiner jig in issue 161 that I made one before reading the rest of the magazine. It's a great jig.

I ran out of birch plywood and so had to postpone making the alignment guide, but assembled everything else. At that point, I decided to mark a centerline out from the joiner and grabbed my plastic speed square to line it up. I realized that the extended base of the square fit nicely into the ¼" dado next to the fence and that the diagonal slot in the square would work with the hold-down bolt in the T-slot. I was so impressed that I decided not to build the alignment guide in the plans. The square is also reversible and comes in a 12" version that will work if you want more support.

Incidentally, the jig is designed for ¾" stock, but will also work on ½" stock by placing a flat piece of ⅛" hardboard under the ½" stock.

Dee C. Baxter, Murphys, Calif.



Lasting memories

When it came time for my grandson's first birthday, I wanted to make him something that would last. I recalled seeing a wagon in a back issue of *WOOD*® magazine. After locating the plan in issue 70, I decided to build it for him.

As you can see, I modified the plan by adding ½" red oak rails and purchased classic wheels.

I really enjoyed building this family heirloom. Hopefully, it will inspire my grandson to follow in my footsteps and take up woodworking someday.

Robert L. Campbell, Newark, Ohio

Calculating board feet

I have enjoyed your magazine for a few years now. You publish a great product. In issue 161 on page 68 you have a Cutting Diagram for the blanket chest. My question concerns the board feet. I thought board feet are calculated by multiplying a board's thickness × width × length (all in inches) and then dividing by 144. So, by my calculations, the ¾×7¼×96" boards contain 3.625 board feet. The cutting diagram has the board feet at 5.3. Do I have the correct way of calculating board feet? I would love to build this project but I don't know how many board feet to budget for it.

Adam Kennedy, Wesley Chapel, Fla.

Your formula is correct, Adam, but requires further explanation. Hardwood lumber comes roughsawn to a thickness designated in "quarters," with a quarter equaling ¼" of thickness. Lumber sold by suppliers comes either roughsawn or surfaced, and 1" hardwood that's surfaced on two sides is still termed 4/4 even though the board measures just ¾" thick, the dimension used in the Cutting Diagram.

The same thing happens with hardwood board widths. Boards are sold in random widths, with the dealer rounding up to the next full inch and charging you for it. The dimensions in the Cutting Diagram represent the surfaced dimensions. Therefore, when figuring the board feet using lumber industry standards, ¾×7¼×96"÷144 translates into 1×8×96"÷144, equaling 5.3 board feet.

The WOOD® *magazine staff*

Safety in arm's reach

You timed your Editor's Angle in issue 162 regarding the drill press accident perfectly. A similar accident sent a workpiece spinning and whacked my thumb, damaging its thumbnail. I have now reorganized so clamps are in easy reach, eliminating any excuse for not using them when drilling.

Rahn Becker, Arnold, Calif.

Article update

April/May 2005, issue 162

• In the chart on page 81, the fastener lengths in inches for the Porter-Cable BN200A should read ¾–2.

HOW TO REACH US

■ **Woodworking advice:**
Post your woodworking questions (joinery, finishing, tools, turning, general woodworking, etc.) on one of 20+ online forums at woodmagazine.com/forums

■ **Editorial feedback:**
Send your comments via E-mail to woodmail@woodmagazine.com; or call 800/374-9663 and press option 2; or write to WOOD magazine, 1716 Locust St., GA-310, Des Moines, IA 50309-3023.

■ **Subscription assistance:**
To notify us of an address change, or to get help with your subscription, go to woodmagazine.com/service; call 800/374-9663 and press option 1. Outside the U.S., call 515/247-2981. Or write to WOOD magazine, P.O. Box 37439, Boone, IA 50037-0439. Please enclose your address label from a recent magazine issue.

■ **To find past articles:**
See our index at woodmagazine.com/index.

■ **To order past issues and articles:**
Order past issues of *WOOD* magazine, our special issues, or downloadable articles from issue 100 to present visit our online store at woodmagazine.com/store, or by calling 888/636-4478. Some issues are sold out.

■ **Updates to previously published projects:**
For an up-to-date listing of changes in dimensions and buying-guide sources from issue 1 through today, go to woodmagazine.com/editorial.

tapes-to-go wall-hung dispensers

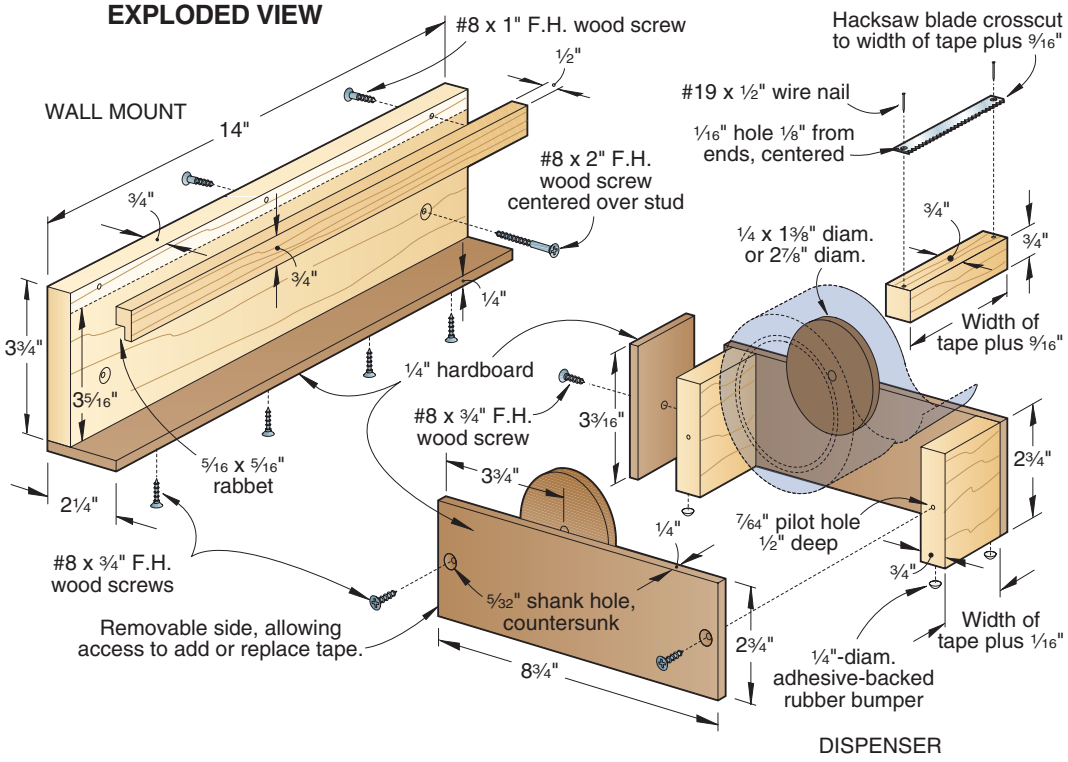
Hang them at a convenient height, and lift off only the dispensers you need.

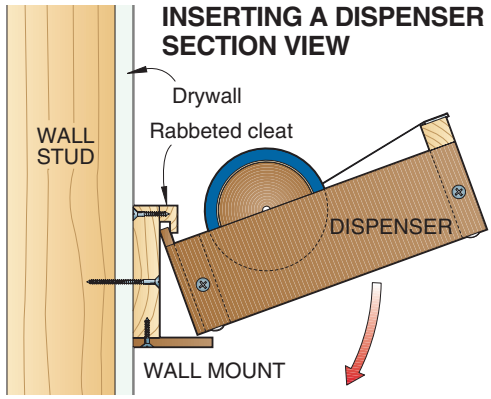
Start by determining how many rolls of tape you use in your shop. Then, create a dispenser for each, as dimensioned in the drawing at *right*. Note that the interior width of each dispenser is 1/16" wider than the roll of tape it holds. Create the discs to be glued to the sides of the dispenser by tracing the inside opening of each roll of tape onto 1/4" hardboard, and cutting them round on a bandsaw or scrollsaw or cutting them with a circle cutter. In our shop, all of our rolls of tape used either a 1 3/8" or 2 7/8" diameter disc (1/8" smaller than the tape inside diameter).

When assembling each dispenser, don't glue one of the sides in place. To load a new roll of tape, simply remove the two screws from one side to gain access. A piece of hacksaw blade serves as a cutter.

Now, build the wall mount as dimensioned. Attach the wall mount in place using fasteners appropriate to your shop wall. To hang a dispenser from the wall mount, lift the front end of the dispenser while inserting the top edge of the back into the rabbeted cleat of the wall mount, where shown at *right*. The project is designed so you can pull tape from a dispenser seated in the wall mount or remove the dispenser from the mount and set it on your workbench.

Project design: **Jeff Mertz**





See more shop project plans at **woodmagazine.com/shoptools**

give laminate a new edge

Use this time-saving approach to form a crisp laminate edge and a rounded wood profile in just one router pass.

Many projects with plastic-laminate tops have wood trim that hides the edge of the laminate, but our computer desk on *page 46* turns that edge into part of the profile.

With the oak trim attached flush with the top of the medium-density fiberboard (MDF) desktop, begin by trimming a piece of laminate roughly ½" larger than the width and length of the desktop. This leaves a ¼" overhang on each edge that you'll trim away as you rout the wooden trim.

To install your laminate, you'll need water-based laminate adhesive, ⅜-½" dowels, a paint roller and tray, laminate J-roller, router with a ⅜" round-over bit, and finishing materials. Here's how to proceed.

APPLY LAMINATE ADHESIVE

STEP 1

Remove chips and dust from the laminate and desktop, and apply water-based laminate adhesive evenly on both surfaces starting with the back side of the laminate, as shown *above*. Avoid gaps or thick spots in your coverage. This water-based adhesive turns a light tan or clear when it's ready, as shown at *left*. Using the back of your finger, check that the adhesive is lightly tacky, but not wet.

FLOAT LAMINATE ON DOWELS

STEP 2

Next, space ⅜–½" dowels about 8" apart and carefully lay the laminate on the dowels so it doesn't brush against the desktop below. Slide the laminate into position, leaving slight overlaps on all four edges. Remove a dowel closest to one end, as shown *above,* and press that end of the laminate onto the desktop. Then work toward the opposite edge, removing dowels as you go and pressing the laminate down from the center to the edges.

BOND LAMINATE TO THE TOP

STEP 3

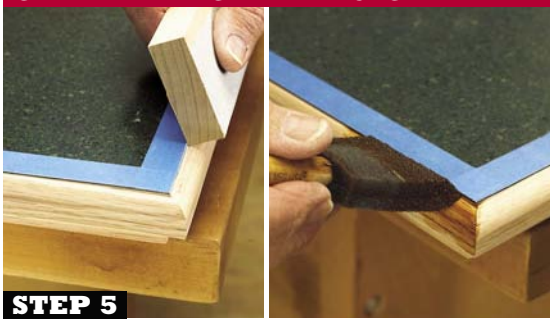
Using a J-roller with a rubber wheel, or the laminate press featured on *page 96*, push the laminate firmly onto the desktop, as shown *above*. Work from the center to the edges to force out any trapped air. Be careful not to apply pressure to the overhanging laminate edges, which could snap.

ROUT THE EDGE

STEP 4

With no wood trim on the back edge of the computer desk, you can remove the excess laminate there using a router with a flush-trim bit. Change to a ⅜" round-over bit for the remaining edges, and set the depth so that the outside straight edge of the bit cuts through the laminate without removing the wood beneath, as shown *above* and *top*. Rout the remaining three edges.

SAND AND FINISH THE EDGES

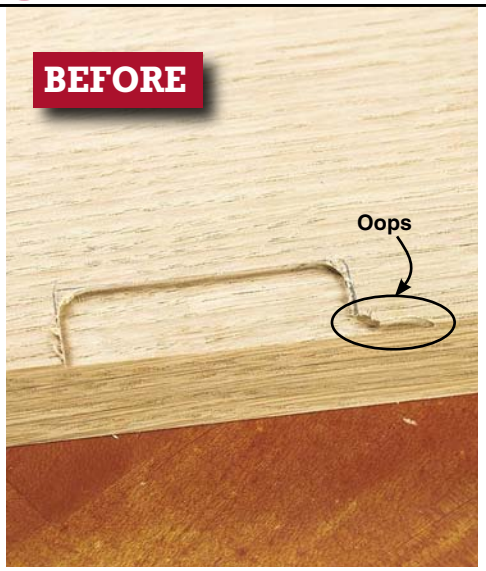


STEP 5

Mask off the laminate, as shown *above left*, and sand off any rough edges with 120-through 180-grit abrasives. Then sand the rounded profile. Stain and finish the trim, as shown *above right*. Desktop edges receive extra wear, so apply two additional coats of finish beyond what you normally use.

Making router miscuts disappear

A simple angled inlay hides accidental gouges.



A bumped elbow, or just a slip of the hand and there it is—a router miscut. Even with your best efforts, you can't always keep them from happening. One common example: You built cabinet doors and carefully measured and marked the hinge locations, and set the router bit to cut to the correct depth. Just as you are completing the recess for the hinge mortise, the cord catches and you accidentally rout outside the marked lines. Is the door ruined? Absolutely not. A simple angled inlay creates a nearly seamless grain match guaranteed to restore the woodwork and a smile to your face.

1 With a sharp knife and clamped straightedge, scribe a diagonal line outside of the mistakenly routed area. By scribing a long line that angles only slightly across the grain, the patch will effectively blend with the surrounding grain. Always avoid butt joints that cut across the grain—those patches will stick out like a sore thumb. Using a straight bit and a secured straightedge, carefully rout the area to the same depth as the mortise.

SCRIBE THE AREA TO BE PATCHED

2 From matching wood, rip a strip slightly thicker than the recess depth. Align the grain of the strip and the workpiece. Then cut a patch that is slightly larger than the routed area. Test it in the recess for fit and grain match.

CUT A PATCH TO FIT THE RECESS

3 Next, apply wood glue. Clamp the patch snugly with tape until the glue dries.

APPLY GLUE TO THE RECESS

4 With the glue completely dry, remove the tape. Using a sharp block plane or sanding block, level the patch flush with the surrounding area.

TRIM THE PATCH FLUSH WITH THE SURFACE

5 Trim excess patch from the door edge and face, then use a sharp chisel to square the mortise. Install the hinge.

ask wood

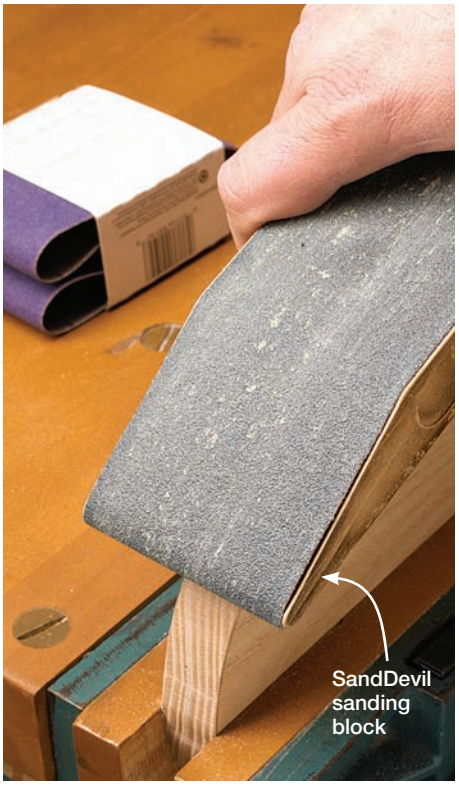
Answers to your questions from letters, e-mails, and WOOD Online®

Broken-belt blues

Q I recently bought a new belt sander and a supply of new belts. Four of those, including the one that came with the machine, fractured at the seam. Could heat and humidity cause these failures? Is there a method to repair these broken belts?

—Bob Mathews, Nokomis, Fla.

A Belt seams rarely fail, despite the friction and high-speed flexing that sanding belts endure. Heat, humidity, and age can contribute to belt seam failures, but they're not the only causes. Check that your belts are turning in the direction indicated on the inside face. When not using your sander, release the tension on the belt. If the problem persists, exchange the sander or have a warranty service center check the tension setting. To rule out belt age as a possible problem, purchase what you expect to use within eight months to a year and store unused belts in a temperature-controlled place. As for repairing those broken belts, there's no safe way to duplicate the heat-activated adhesives used by manufacturers, so carve up those old belts for your hand-held sanding pad.



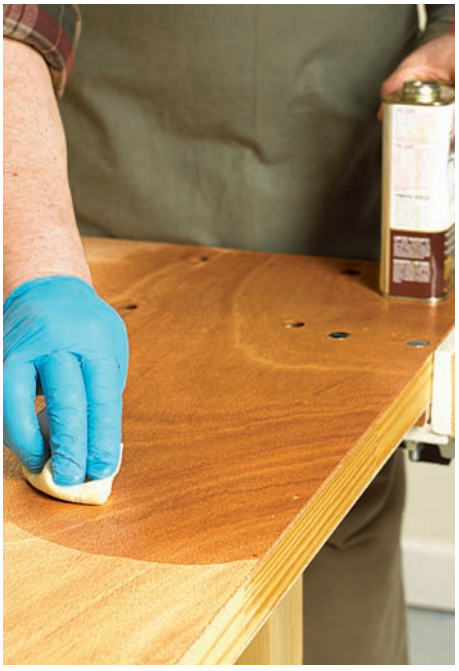
New belts work best, but you can give old ones a second life in a shop-made sanding block or the wedge-shaped SandDevil from Beloff-Pappas Co. ($9.99; 800/974-3557 or sanddevil.com).

Both sides of finishing

Q I finished my workbench top with several applications of Watco Danish Oil, top and bottom. I know it periodically will need re-oiling. Should I re-oil the bottom, too? You're supposed to put equal finishes on both sides of a panel to prevent uneven moisture absorption. Will the unexposed bottom dry out like the top?

—Jim Culler, Bellville, Ohio

A Even after you apply several coats of oil/varnish to the top, Jim, the level of film finish build-up is too thin to create uneven moisture absorption problems, especially on a panel as thick as a workbench top. Just avoid repeatedly soaking the benchtop with water, which could swell the wood enough to produce checking when it dries.



Two different vacuums for two different jobs

Q I want to add a dust-collection system to my shop. When my house was built, I had it pre-plumbed for a whole-house vacuum. Can any of the shop dust-collection systems be used as a whole-house vacuum, or can any house systems be used for work-shop dust collection?

—Dave Fricke, Akron, Ohio

A Either way, Dave, we've gotta say no. A central vacuum system is designed to pull air through 2" pipes at roughly 110 to 210 cubic feet per minute (CFM). A whole-house system outlet in your shop is fine for collecting fine sawdust and a light amount of small chips, as shown *below*, but a planer, jointer, or tablesaw hooked up to such a system would quickly choke those narrow pipes with debris.

Turning a workshop dust collector into a whole-house vacuum presents two problems. You'll need a way to automatically switch on the vacuum when you plug in the hose, a standard feature on whole-house vacuums. Even if you solve that problem, there's still the risk of damaging the motor by trying to draw approximately 1,400 CFM—the airflow for a 2hp dust collector—through pipes and attachments with openings 2" in diameter or less.

Central vacuums won't replace cyclone dust collectors, but they're still handy for general cleanup. The Dust Driver accessory for Beam (800/947-2326 or beamvac.com) vacuums includes a 32' hose and 22"-wide brush for bare floors.

continued on page 20

Does polyurethane glue take stain?

Q: In issue 155, page 112, you talked about polyurethane glues. Once the foam dries and you chisel it off, does the glue prevent the wood from absorbing stain?

—Tom Motzko , via WOOD Online

A: Good question. To answer it, we edge-glued two boards using polyurethane glue, sanded the joint, and stained the glue-up with two applications of Varathane red oak. Both the seam and the surrounding wood colored identically.

Not all bird's-eye is maple

Q: I was cutting some firewood on our property when a friend—a professional logger by trade—commented that a few of the ash trees I felled looked as if they were bird's-eye ash. He said it was very rare, but exists. Is there such a thing?

—Travis Johnson, Thorndike, Maine

A: "Bird's-eye" figure appears most commonly in sugar maples, Travis, but it isn't limited to that species. Sugar maples that mature under stressful growing conditions seem especially prone to developing a bird's-eye pattern, but other types of trees can develop it, too. These include other species of maple, birch, and ash. You can't spot a tree with bird's-eye figure from the outside, though. Only a trip to the sawmill will confirm your friend's suspicions. If you want to satisfy both your curiosity and budget, saw and split a section of the trunk, then rough-plane it enough to confirm the figure of the wood. Look closely, though. The samples we obtained from Certainly Wood (716/655-0206 or certainlywood.com), shown *above*, show that the bird's-eye patterns in ash are far more subtle than what's in maple.

Bird's-eye ash

Bird's-eye maple

Got a question?

If you're looking for an answer to a woodworking question, write to **ASK WOOD, 1716 Locust St., GA-310, Des Moines, IA 50309-3023** or send us an e-mail at **askwood@mdp.com**. For immediate feedback from your fellow woodworkers, post your questions on one of our woodworking forums at **www.woodmagazine.com/forums**.

shop tips

Helping you work faster, smarter, and safer

Pivoting casters for stability and smooth travel

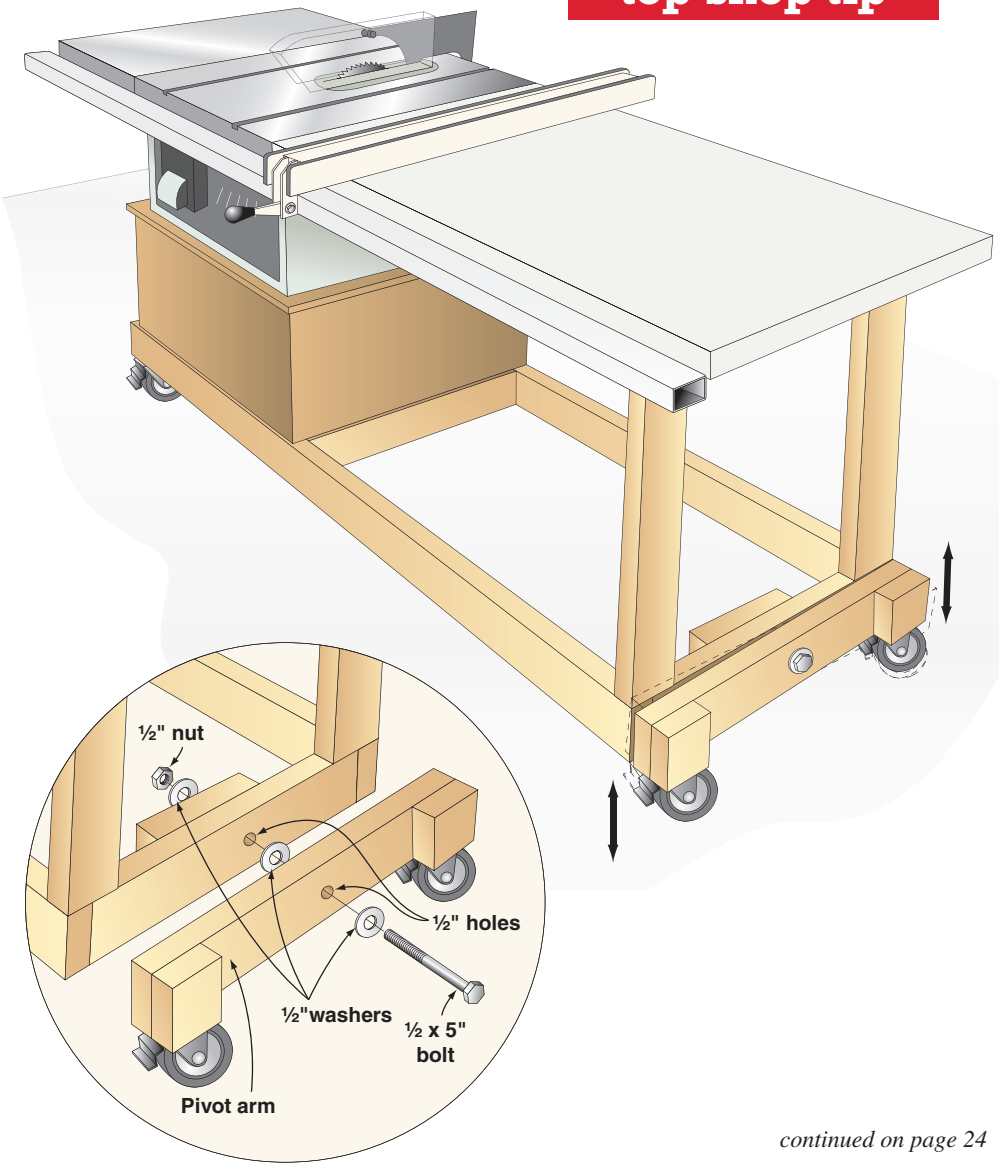
When designing a mobile base for my tablesaw and its extension table, I was concerned about how a four-wheeled base might twist and rack as the large, heavy saw moved across my uneven garage floor. Using the principle that any three points in space form a plane (like a tripod), I built a frame that includes both a triangular plane for stability and four casters for better weight distribution on the casters.

To create the tripod effect, I installed two fixed casters on the base at the heavy end of the saw to form the first two points of the triangle. For the third point, I built the pivot arm, shown *below*, and attached it to the base with a ½×5" bolt, washers, and nuts.

As the base rolls across the uneven floor, the two casters on the pivot arm are free to pivot up and down to conform to the floor, with the bolt acting as a pivot point. Yet, in use, the stand is as stable as any three-point wheelbase.

—Gordon Hofer, Santee, Calif.

top shop tip



continued on page 24

Our Winner

Photo: Terri Johnson, Agape Photography

Gordon Hofer's former career in mechanical design and engineering prepared him well for doing woodworking in his retirement. In the "seven or eight years, off and on" he's been building projects, he's already crafted cabinets to house his big-screen TV and his sons' big-screens. And we found his Top Shop Tip, at *left*, darned clever. "I've always known that three points define a plane," Gordon says, "but it's the first time since I retired that I found a practical use for the concept."

For sending this issue's Top Shop Tip, we're upgrading Gordon Hofer's shop with a Delta 22-680 portable planer. Good going, Gordon!

Top tips win tools!

Describe how you've solved a workshop problem, and you'll earn $75 if it appears here. And, if your tip garners Top Shop Tip honors, you'll also win a tool prize worth at least $250.

Send your best tips, along with photos or illustrations and your daytime phone number, to: **Shop Tips, WOOD Magazine, 1716 Locust St., GA-310, Des Moines, IA 50309-3023**. Or e-mail tips to: shoptips@woodmagazine.com. Remember to include your contact info in the e-mail as well.

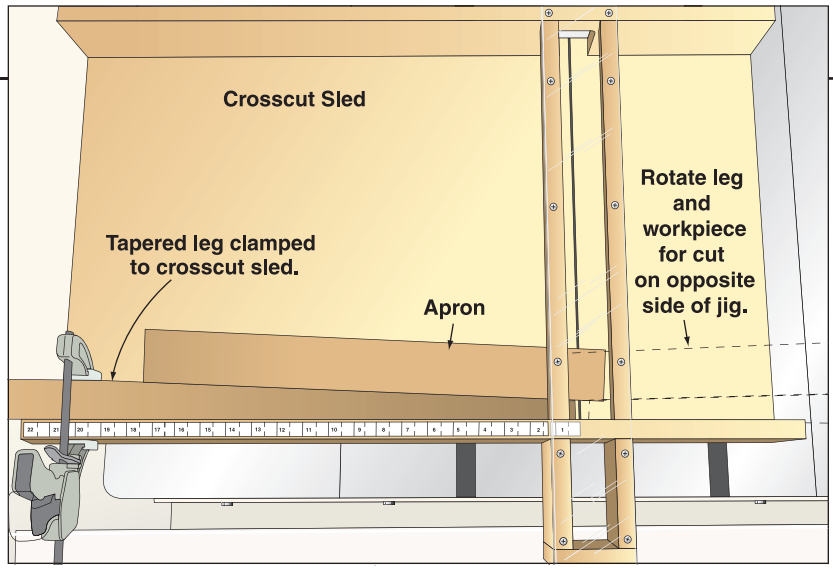
Because we try to publish only original tips, please send your tips only to *WOOD* magazine. Sorry, submitted materials can't be returned.

Try this for a perfect-fitting apron between tapered legs

After using a tapering jig to make tapered legs for a desk project, I needed to cut the rails that would form the apron between these tapers. At first, I thought I would have to figure out the angle to get the cheek cuts right. Then I realized I didn't need to take chances with guesswork.

To make the cheek cuts for the apron's tenons, clamp one of the tapered legs to the crosscut sled and use it as a fence for the apron. After cutting one end of the apron, place the leg on the other side of the blade to make the other cuts. The angle of the leg's taper provides the goofproof angle setting.

—Ray Ladouceur, Cincinnati

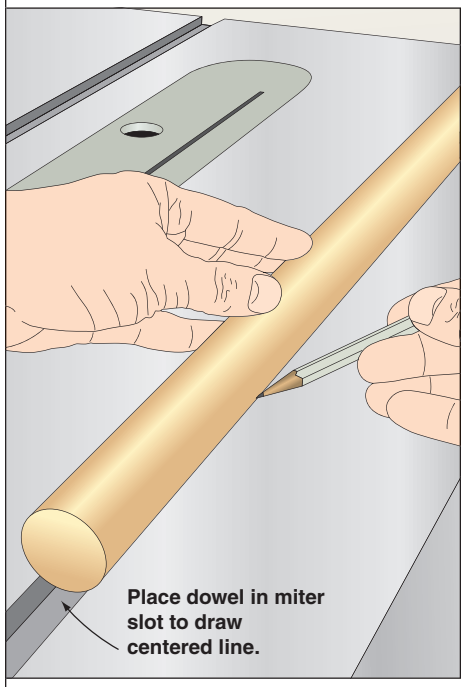


Simplifying straight lines on dowel rods

If you've ever tried to draw a straight line down a length of dowel to mark hole locations, you know how difficult it is to hold a straightedge along a round surface. Not only is that tough, but dowels are rarely straight. Here's the solution.

For a dowel ¾" or larger, place it in the miter slot of your tablesaw. Push the dowel into the slot until it's straight, and then draw a straight line where the edge of the slot meets the dowel. For dowels smaller than ¾", cut a small dado into a scrap board and use the same technique.

—Thomas Luc, Laurel, Md.



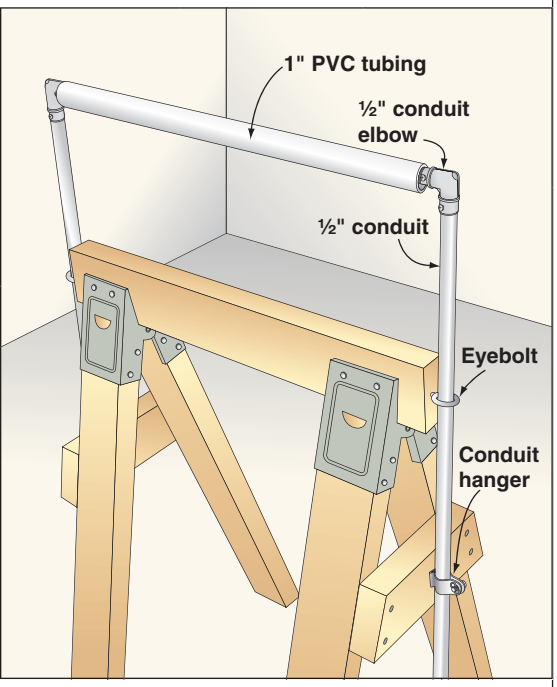
Add an adjustable outfeed roller to your sawhorse

When I needed an outfeed support for some long cedar deck boards I was ripping on my tablesaw, my sawhorses were not tall enough nor would they allow the wood to slide past. Fortunately, some leftover ½" electrical conduit and PVC pipe provided a solution. My wooden sawhorses now serve double-duty as adjustable outfeed supports.

To make the roller frame, cut two pieces of conduit, a bit shorter than the sawhorse height, to work as side posts for the roller. Add a conduit hanger low on each end of the sawhorse to fix the roller's height. Next, drive a wood-screw-type eyebolt, with an eye large enough to accommodate the conduit, into the sawhorse's top brace to act as a guide. Attach the side posts, and add a ½" conduit elbow. Measure the distance between the elbow ends, add 1", and cut the conduit crosspiece.

With the frame pieces cut and side posts installed, slip a piece of 1" PVC pipe over the crosspiece and fit the roller into the elbows. The roller parts are easily removed and rest nicely on the sawhorse cross braces. Also, the conduit hangers, equipped with wing nuts, offer infinite adjustability and can compensate for an uneven floor, or in my case, an uneven patio/yard where I set up my tablesaw.

—Dave Baer, St. Louis

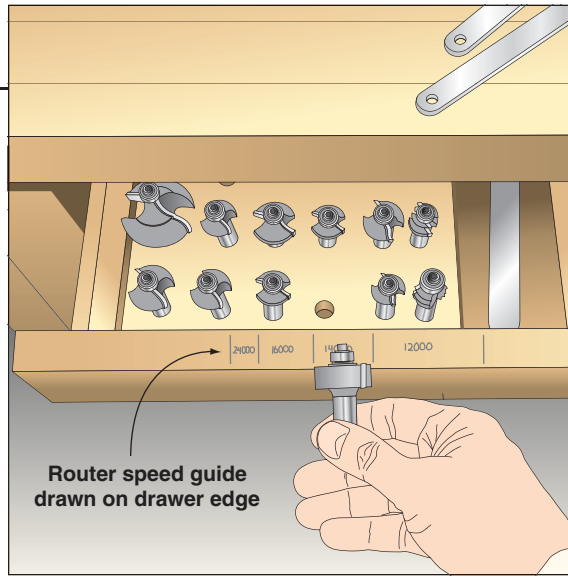


Speed guide adds purpose to router bit storage

In *WOOD*® magazine issue #159 (page 16), you listed the correct speed range to use for router bits of various diameters. This guide gave me an idea.

On the top edge of my router bit drawer, I drew hash marks corresponding to various bit diameters. Between these marks, I wrote the appropriate bit speed from your guide. Now, when I pick up the bit I want, I simply hold it against this guide to determine the correct router speed.

—Kevin Greene, Baskerville, Va.



colorful finishes to dye for

Here's an easy and safe way to beautify and protect toys and other brightly toned projects.

Long after today's fad toys end up in a garage sale or trash can, wooden toys will be handed down as heirlooms. So give them a vivid finish in a rainbow of colors that will endure for generations. The best way to do that: Mix a non-metallic, water-soluble dye combined with a water-based gloss finish to make a tinted coating (also known as a toner) that lets the wood grain show through. It's as simple as that.

Furnituremakers have long used toners for consistent coloration, even in pieces that combine woods of different species or woods that tend to soak up stains unevenly, such as pine, maple, or cherry.

Here, we'll show you how to mix your own toners for a kids' project, such as the blocks on *page 30*. The resulting finish is perfectly safe for children. To protect the color, add two more clear coats of water-based finish.

Prepping the wood

First, sand your wood pieces to 220 grit. Then raise the grain by moistening the wood with a water-dampened cloth. After it dries, lightly sand with 220-grit sandpaper just enough to knock off the raised fibers.

Mixing toner

To begin, round up an assortment of water-soluble dyes and a water-based gloss finish. (See Sources for dye suppliers.) The colors shown here represent just a sample of what's available. Also, you'll need quarter-teaspoon and half-cup measures, stirring sticks, plastic or glass mixing jars, nylon mesh for straining mixtures, disposable gloves, and foam brushes.

Mix enough tinted finish for your project, plus a little extra for touch-ups or unexpected problems. For our set of kids' blocks, we mixed batches of finish in the ratio of a quarter-teaspoon of dye powder to a half-cup of water-based finish.

Consider this ratio a starting point. You'll probably want to vary your ratios for the dyes you use to achieve the degree of color you want. Some colors are more intense than others at the ratio we used, especially the red and blue shades. For dyed finish mixing instructions, see "Make Bright Tinted Finishes in Three Easy Steps," at the top of *page 28*.

Applying finish

Apply tinted water-based finish as you would any clear finish. By capturing the color in the finish itself, you've minimized blotching that occurs when you saturate such woods as pine with straight water-based dye. Pay special attention to laying down an even, streak-free coat.

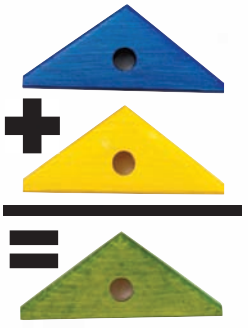
You can add more color to your project by applying a second coat. Or you can add more water-based finish to the mix to thin the color and allow more wood grain to show through.

Finish your projects by covering the tinted coat with two coats of clear finish.

Variations on a theme

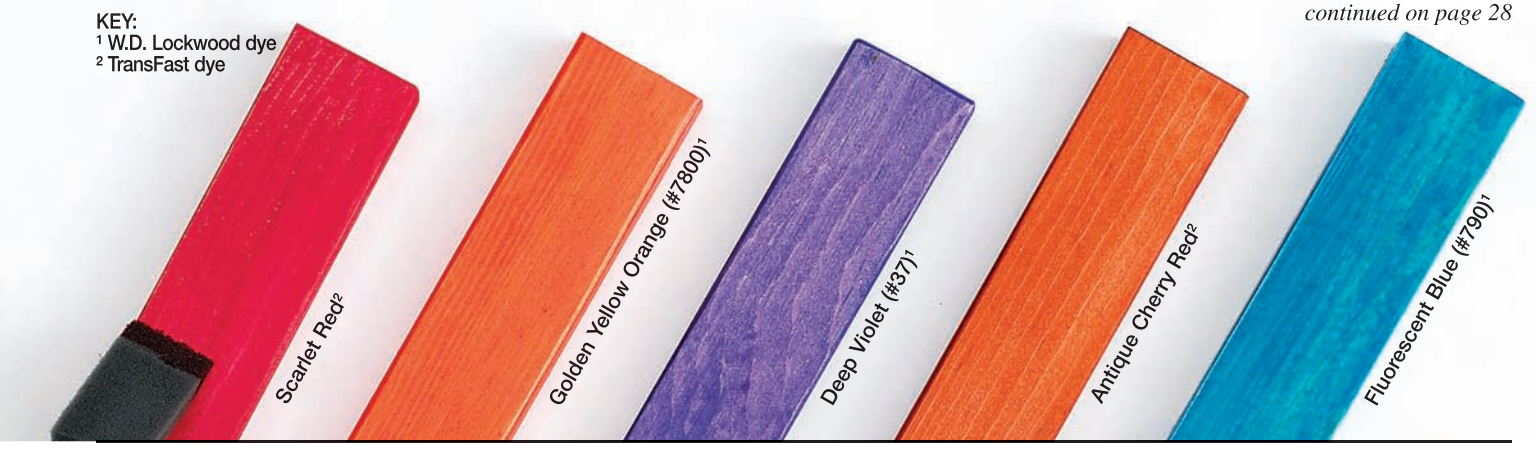
Once you get the hang of applying tinted finishes, feel free to experiment.

Mix dyed finishes to expand your color selection. One tablespoon of TransFast blue and two tablespoons of lemon yellow create a medium shade of green, as shown at *right*. Try other combinations of dyes by mixing red and blue to make purple, or red and yellow to make orange.



continued on page 28

KEY:
[1] W.D. Lockwood dye
[2] TransFast dye



MAKE BRIGHT TINTED FINISHES IN THREE EASY STEPS

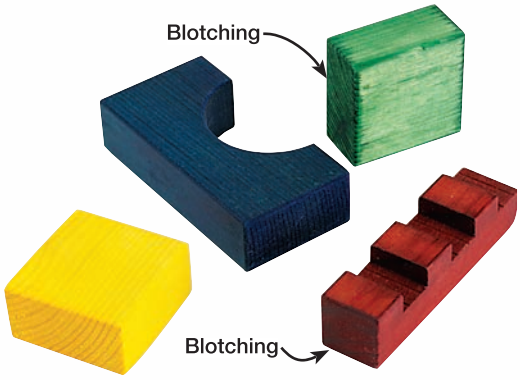
Step 1: Add a half-teaspoon of water to a quarter-teaspoon of dye powder to make a paste that will mix with water-based finish.

Step 2: Pour a half-cup of finish into the paste, and stir until the mixture turns an even color. Break up clumps of undissolved dye.

Step 3: Strain the mixture through a nylon mesh to remove undissolved dye clumps or finish that becomes lumpy after reacting to dye.

Wood species vary in how they're affected by dyed water-base finish, which obscures less of the oak grain than the pine. The yellow shows more wood pores than the red.

WHAT HAPPENS WITHOUT TONER



Straight dye can have mixed results. The yellow and blue pine blocks absorbed stain evenly, unlike the green and red samples.

Even bright finishes gain the look of antiques with light sanding and a touch of stain.

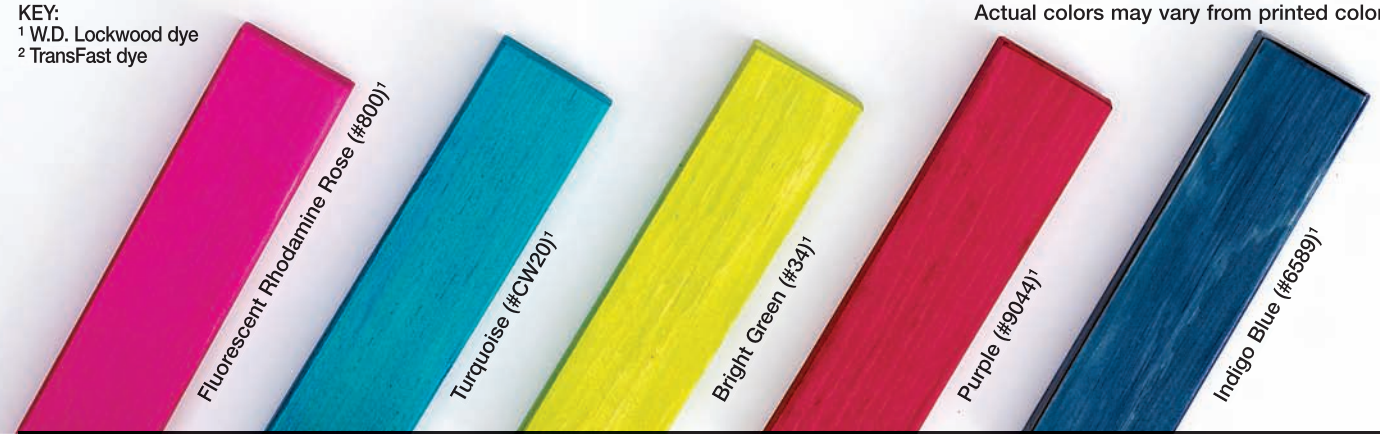
Different wood species produce wood surfaces with a different look and feel. For example, we tried yellow and red on both pine and oak with good results, as shown *above*. Light-color woods provide the brightest colors, while such species as red oak create sharper grain contrast.

For an aged look that suggests a toy has already survived generations of play, apply bright finishes and scuff-sand the edges and corners for a worn look. Before you apply the protective clear top coats, rub on a light coat of any brown stain to create an aged patina, as shown *left*. Then preserve your new antiques with two coats of clear finish.

Sources: For a list of TransFast dye suppliers, call Homestead Finishing Products at 216/631-5309 or visit homesteadfinishing.com. To order W.D. Lockwood dyes, call 866/293-8913 or visit wdlockwood.com.

KEY:
[1] W.D. Lockwood dye
[2] TransFast dye

Actual colors may vary from printed colors.



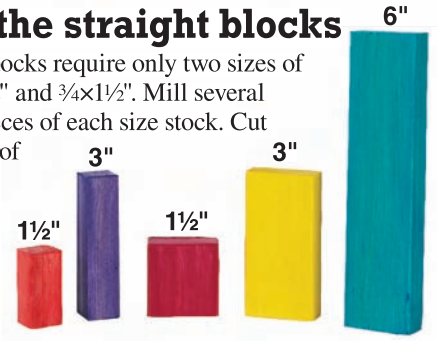
playtime building blocks

Give kids an assortment of wooden blocks, and watch them create fantasy structures fit for a king.

You could buy toys and games for kids, but nothing stimulates their imagination like wooden blocks made in your own workshop. They're durable and take just a few hours to make. We used pine and cedar scraps for ours, but any light-colored woods will work. To achieve the brilliant colored look of the blocks shown here, follow the finishing method on *page 26*.

Make the straight blocks

The basic blocks require only two sizes of stock: ¾×¾" and ¾×1½". Mill several 24"-long pieces of each size stock. Cut several sets of blocks to the lengths shown at *right*.



Note: *Working with small pieces requires firm support, such as a zero-clearance insert in your tablesaw, and using backer boards when cutting with a tablesaw miter gauge or mitersaw.*

Cut shaped blocks

The shaped blocks are made from the same ¾×¾" and ¾×1½" stock as the basic blocks. Find the dimensions and full-size patterns for each shape in the *WOOD Patterns®* insert. Then follow the instructions shown for each. After cutting all of the pieces, ease the sharp edges with a router and a ⅛" round-over bit or sandpaper. Prepare the blocks for finishing by sanding through 220-grit paper.

ARCH AND HALF-CIRCLE

Make several photocopies of the arch pattern and adhere it to the stock with spray adhesive. Cut the desired number of pieces to length. Install a #12 blade in your scrollsaw and cut out the half-circle following the line carefully.

TRIANGLE

On a length of 1½" stock, lay out the triangles using the dimensions found in the pattern insert. Carefully drill the ⅜" hole where indicated on the pattern. Then using a mitersaw or tablesaw and miter gauge, cut the triangles to the correct size.

BUTTRESS

To make the buttresses, rip a length of 1½"-wide stock to 1" wide. Lay out the needed number on the stock according to the pattern, and cut the pieces to size.

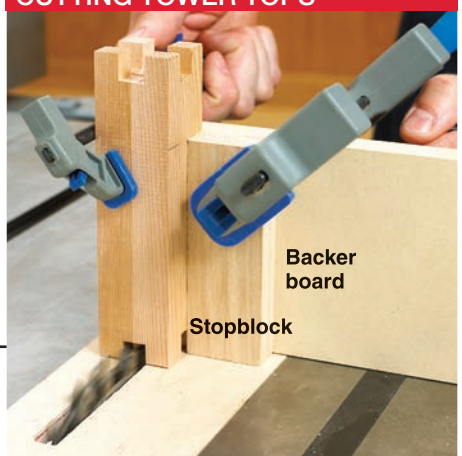
CRENELATED TOP

Cut the crenelated tops from ¾×¾" stock. Lay out the stock as shown in the pattern insert, and cut ½" dadoes ¼" deep the full length of the workpiece. Then cut the dadoed stock into 3" lengths.

TOWER TOP

To make the tower tops, laminate two 24" lengths of ¾×1½" stock together to form a 1½×1½" blank. After the glue dries, clean off any squeeze-out and square the ends. Set up a ½" dado set in your tablesaw to make a ½"-deep cut. Mark out both ends of the blank shown on the pattern. Using a miter gauge with a backer board and stopblock, cut the tower tops, as shown *below*. Now cut the tops to 1½" long, and repeat the procedure.

CUTTING TOWER TOPS



fittings for a tidy desk

Special hardware makes it easy to organize your desktop digital universe.

Does your computer desk look like the embodiment of chaos theory? Well, you don't need an Einstein to put things in order, just the right hardware. To help you, we scoured a stack of woodworking-supply catalogs to find the best easy-to-install home office desk accessories. Then we tried them out. Here's a sampling of problem solvers that'll smooth out the wrinkles in your organizing scheme, both on and under your desktop.

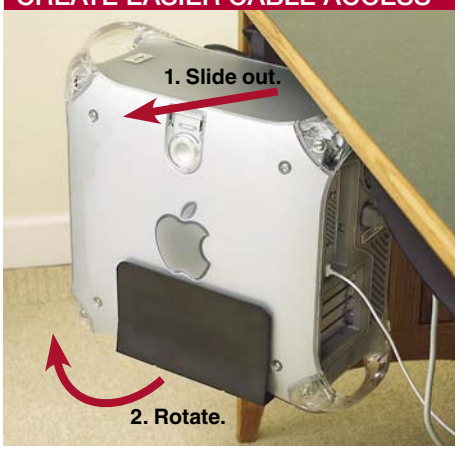
Sources

Lee Valley Hardware. Call 800/871-8158, or go to leevalley.com.
Rockler Woodworking and Hardware. Call 800/279-4441, or go to rockler.com.
Woodworker's Hardware. Call 800/383-0130, or go to wwhardware.com.

MAKE YOUR KEYBOARD AND MOUSE DO A DISAPPEARING ACT

Tube-type monitors often leave little room on the desktop for a keyboard and mouse. An easy-to-install keyboard tray, shown *above left*, solves the space problem and is adjustable for typing comfort. To free up space for other uses, simply lower the tray, swivel the mouse platform as shown *above right*, and slide the assembly under the desktop. *($79, Lee Valley)*

CREATE EASIER CABLE ACCESS



Fastened to the desktop, a swiveling holder gets your CPU off the dusty floor. To connect or disconnect cables, just slide the CPU forward and rotate it. *($49, Lee Valley)*

ORGANIZE YOUR WIRES

Essential for routing wires through a desktop, grommets come in a wide range of shapes, sizes, and colors. Materials include plastic, wood, and metal. *($3–$7, Rockler)*

INSTALL A POWERFUL SOLUTION FOR CONNECTING YOUR LAPTOP

Now you see it. Ideal for laptop users, this flip-up power station saves you from crawling under your desk every time you need to connect to power and the Internet.

Now you don't. When you need your desk for other things, simply unplug your laptop and pivot the power station closed to leave a flush, uncluttered desktop. *($90, Rockler)*

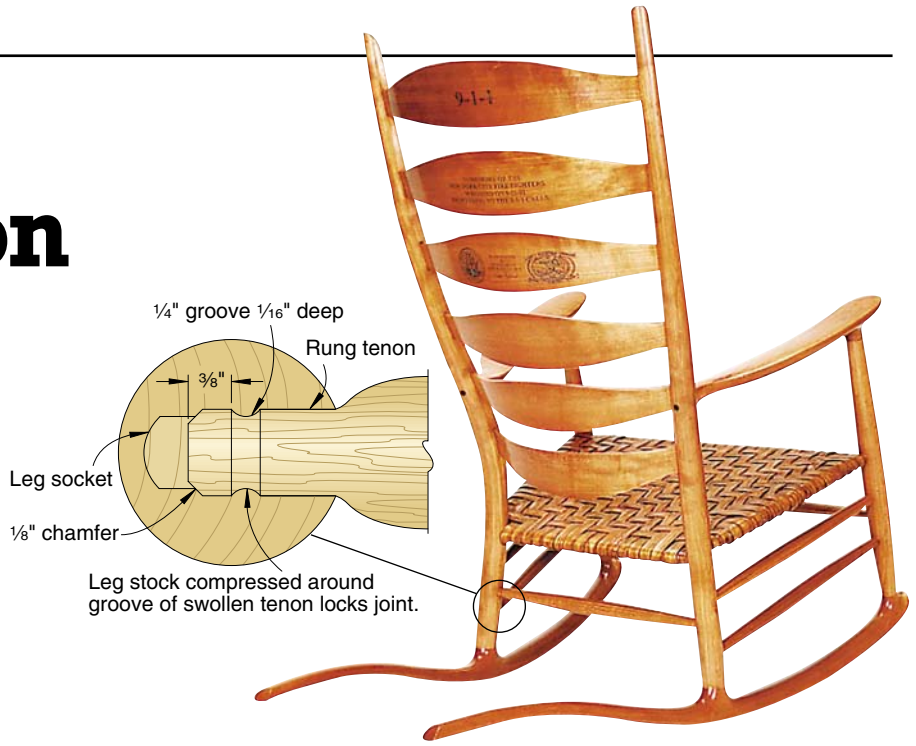
STORE YOUR ANALOG TOOLS

You'll still need a place for pens, pencils, scissors, and tape. This complete, ready-to-install pencil drawer mounts with just four screws. *($20, Woodworker's Hardware)*

the enduring

locked tenon and socket

Expert Russ Filbeck reveals why this age-old joint stays fixed for generations, and how he creates it in his handcrafted, heirloom-quality chairs.



Locked tenon-and-socket joints ensure the longevity of this cherry, ladder-back rocking chair, made by Russ Filbeck in memory of the New York City firefighters who died on September 11, 2001. The chair is in use in NYC Hospital's Cornell Burn Center.

Ever wonder why the tenon-and-socket joints in many colonial-era chairs remain wiggle-free to this day? It's not because of the glue bond, which undoubtedly failed long ago. And it's not the joint's snug-fit. So, what's the secret?

As I discovered years ago, it's a locked joint formed when a dry, grooved tenon swells inside a socket as the tenon absorbs moisture from the glue. Here's how I produce this tenacious joint in my reproductions of American classic Windsor and ladder-back chairs.

Russ Filbeck

The process in a nutshell

I begin by turning or shaving the chair legs and rungs from air-dried wood having a moisture content of about 15 percent. (Because the rungs will be dried to a lower moisture content, it's also okay to use kiln-dried wood for them.) I then form 1 1/16"-diameter tenons 1⅛ to 1¼" long on the ends of the rungs using a lathe or, when working with riven wood, a drawknife and spokeshave.

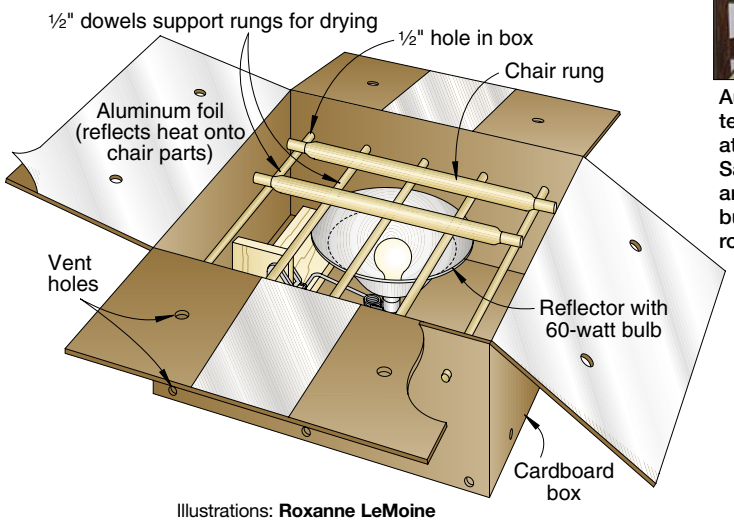
After this stage, I dry the rungs for a week to a moisture content of about 5 percent by putting them in a simple homemade kiln, shown *right*. At the end of the drying cycle, I drill ⅝" holes (sockets) in the legs. Then, I trim the rungs' tenons using a ⅝" tenon cutter so they'll fit snugly in the legs' sockets. (The drill-driven tenon cutter is similar to a large pencil sharpener, and it creates a round tenon with a radiused shoulder that reduces joint stress.)

Using a rasp, sharp knife, or lathe, I shape the rung tenons by chamfering their ends and forming a ¼" groove 1/16" deep around them ⅜" from their ends, where shown on the drawing, *above*. The chamfer eases insertion of the tenon in the socket, and the groove forms the locked joint.

Finally, to assemble the chair, I apply glue in the leg sockets, and insert the rungs' tenons in them, positioning the rungs so their medullary rays (which can be seen on their ends) are vertical and in line with the lengthwise grain of the legs. This alignment ensures the joints stay tight when the parts expand and contract in response to seasonal changes. Unless there is joint movement, I do not find it necessary to band-clamp the chair while the glue dries.

As the tenons absorb moisture from the glue, they swell and cause the leg tissue surrounding the socket to compress around the grooved tenons to form locked joints. These unyielding joints become even stronger as the legs dry and the sockets shrink.

HOMEMADE KILN



Illustrations: **Roxanne LeMoine**

Author Russ Filbeck teaches woodworking at Palomar College in San Marcos, California, and specializes in building ladder-back rocking chairs.

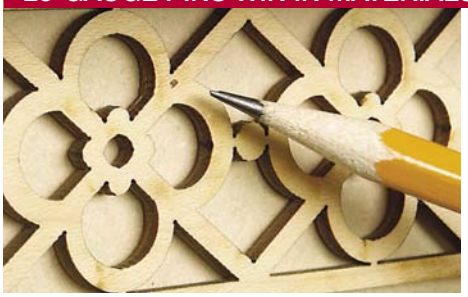
our editors test

23-gauge pinners

Why buy?

23-gauge pinners punch fasteners so fine (about the same diameter as a household straight pin) that they won't split even thin or brittle stock. Unlike 18-gauge brads or finish nails, the pins lack heads, so the tiny entry hole can be filled with a quick swipe of a wax filler stick after finishing. Despite their headless nature, we found that pins hold surprisingly well—in fact, a pin driven more than halfway into hardwood proves almost impossible to pull out. Still, for a long-lasting hold, in most cases you should apply glue to parts pinned together. Pinners have another advantage over brad nailers: There's no safety tip to keep the tool from getting tight into corners. However, 18-gauge tools drive fasteners up to 2" long, where the largest-capacity pinners max out at 1⅜".

23-GAUGE PINS WIN IN MATERIALS NARROW OR THIN



This fragile laser-cut molding (made from 3/32" plywood) didn't split, bulge, or splinter when attached with a 23-gauge pinner. That .010"-diameter pin hole will virtually disappear into open-grained woods, with a smear of filler.

Even in thin solid wood, such as this piece of oak that tapers to 1/32", splitting rarely occurs. We also drove pins to within 1/16" of the edge or end of a solid-wood workpiece, regardless of its thickness, with little risk of splitting.

QUICK TIP

Without heads to tell top from bottom, clips of pins have arrows to identify the beveled end, which loads "down" in the pinner. Before loading, mark clips with a felt-tip marker to help you orient partial, arrowless clips.

Grex P635, $200

Editor test-drive:

As far as I'm concerned, the Grex P635 is the Lexus of pinners, with a ton of great features that put it at the top of the pack. For example, with some pinners, you must manually adjust the magazine for different fastener lengths: This tool self-adjusts for pins from ½" to 1⅜", so you just load and fire. The P635 has no adjustment for setting the drive depth of fasteners, but regardless of the length of pin or hardness of the wood, it set them to perfect depth.

This is the only pinner we tested that provides a removable no-mar tip to reduce dimpling, and it does a good job protecting even soft woods when using moderate pressure. That tip also sports index lines on all four sides for precise placement of pins in a narrow workpiece.

—Tested by Chuck Hedlund, Master Craftsman

To learn more:

888/447-3926, grexusa.com

Porter-Cable PIN100, $125

Editor test-drive:

The PIN100 compares to the Grex P635 with a self-adjusting magazine and a rear exhaust to keep oil off your work. In softwoods and softer hardwoods (such as cherry and poplar), this pinner properly sets its full range of ½–1" fasteners with a light touch—basically the weight of the tool—and imperceptible marring. In oak and ash, however, I had to use firmer pressure to avoid leaving the pins just a whisker proud of the surface. I was pleased to see that the additional pressure didn't cause any workpiece marring.

I was skeptical about the value of a pinner in my shop, but the PIN100 made me a believer, performing almost flawlessly in my tests. Its reasonable price includes 2,000 pins and a storage case.

—Tested by Bill Krier, Editor-In-Chief

To learn more:

800/487-8665; porter-cable.com

Central Pneumatic 45658, $60

Editor test-drive:

For half the price of a typical 23-gauge pinner, the compact Central Pneumatic 45658 delivers reliable results without a lot of frills. At 7" long and 6½" tall, it's about 3" shorter in both dimensions than my 18-gauge brad nailer. In hardwoods, such as cherry and white oak, I observed little workpiece marring, and that sanded away easily with a few strokes of fine-grit sandpaper. Soft woods dimpled regardless of my hand pressure, so I wouldn't use this tool on them.

Two minor sources of irritation: The crude safety switch is either "on" or "off", so care is required to not accidentally fire a fastener. And, the magazine requires manual adjustment for different pin lengths (½–1"), but the scale is metric, not English. I found it easy to eyeball the setting, though.

—Tested by Dave Campbell, Tools Editor

To learn more:

800/423-2567; harborfreight.com

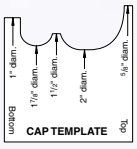
salt & pepper mills

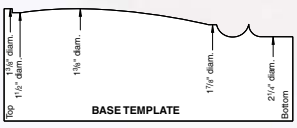
Beautiful wood and quality hardware guarantee projects that look good and perform flawlessly.

Grinding pepper in a tabletop mill as you need it lets you take full advantage of the rich spice flavor. But why do you need a salt mill? Isn't salt just salt? Not any more. Gourmet sea salts are becoming popular and the larger grains and flakes of sea salt need to be ground before use. Here you'll turn identical bodies for both mills. They use slightly different hardware that install the same.

1 Create the templates

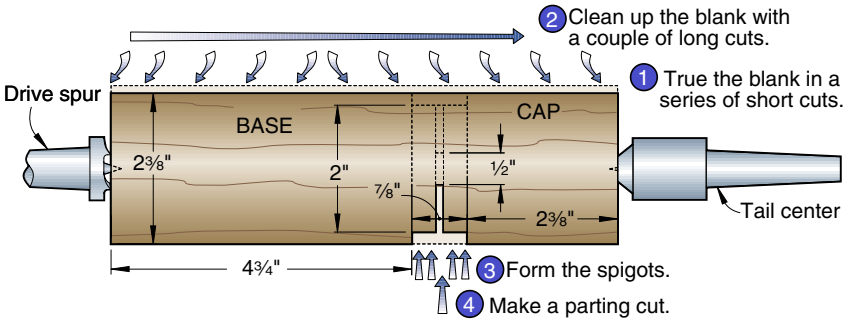
Make a copy of the two templates on the *WOOD Patterns*® insert, and adhere them with spray adhesive to ⅛" tempered hardboard. Scrollsaw the templates to shape, as shown at *far right*.

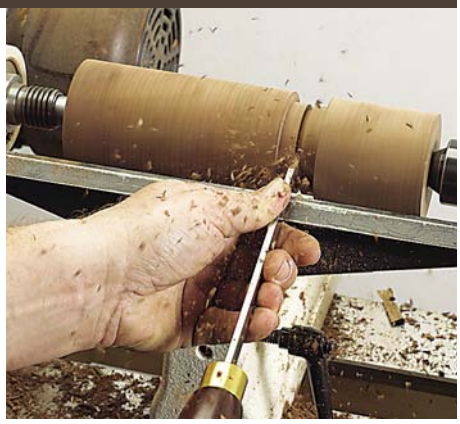




2 Rough and part the blank

Tools: ¾" roughing gouge, 3⁄16" parting tool.
Tool rest: At center.
Speed: 1,000 rpm.

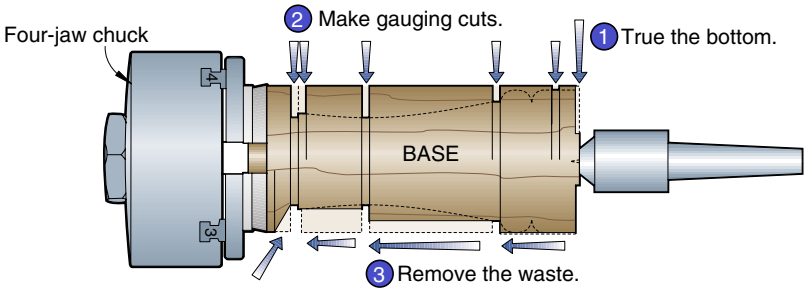


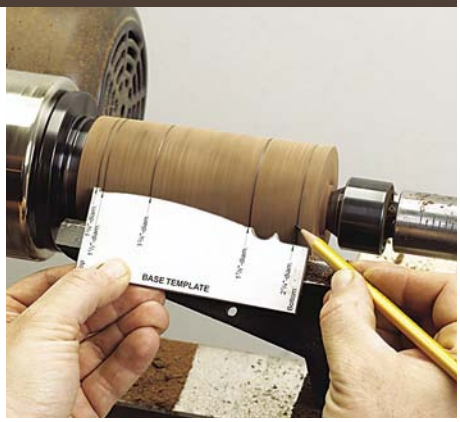


Mount a 2½×2½×8" turning square between centers. (We selected walnut for the pepper mill and maple for the salt mill. See **Source**.) Use your roughing gouge to turn the square to a 2⅜" cylinder. To form spigots on the top of the base blank and the bottom of the cap blank, use your parting tool to turn a ⅞" section of the cylinder to a 2" diameter, where shown *above left*. Then make a parting cut at the center of the 2"-diameter section to a ½" diameter, as shown *above*. Stop the lathe and finish the cut with a fine-toothed backsaw.

3 Rough-turn the base blank

Tools: 3⁄16" parting tool, ¼" spindle gouge.
Tool rest: Parting tool, at center; spindle gouge, slightly below center.
Speed: 1,000 rpm.

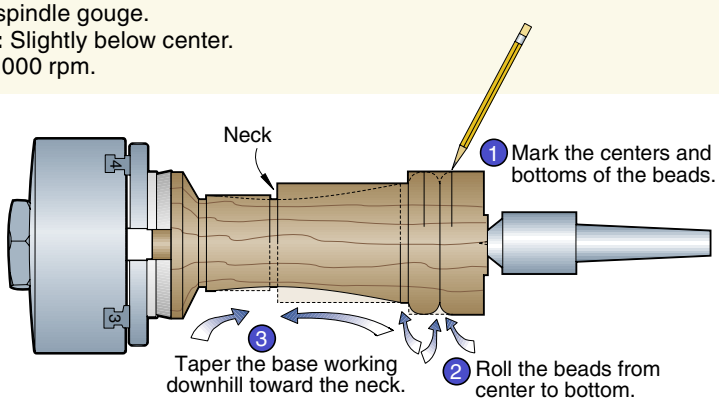




Remove the drive spur from the headstock and replace it with a four-jaw chuck. Grip the base blank spigot with the chuck jaws, making sure the ends of the jaws are tight against the shoulder of the spigot. Engage the tail center to support the base blank, and true the bottom with your parting tool. Transfer the locations of the critical diameters on the **Base Template** to the blank, as shown *above right*. Then use your parting tool to make gauging cuts to the diameters indicated, stopping the lathe to check with calipers. Now use your spindle gouge to remove most of the waste, forming the three-step blank shown *above left*.

4 Form the base profile

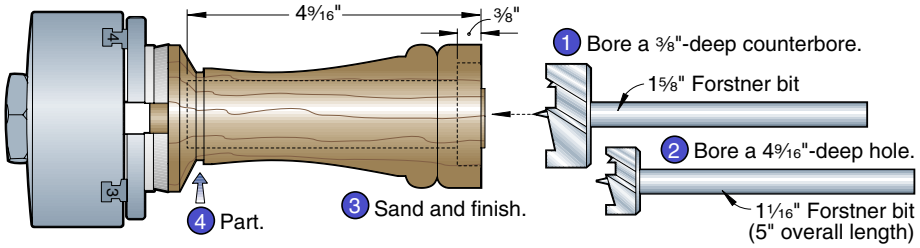
Tool: ¼" spindle gouge.
Tool rest: Slightly below center.
Speed: 1,000 rpm.


Neck
1 Mark the centers and bottoms of the beads.
3 Taper the base working downhill toward the neck.
2 Roll the beads from center to bottom.

With a pencil, transfer the locations of the centers and bottoms of the full and half beads from the **Base Template** to the base blank, where shown *above*. Then use your spindle gouge to roll the beads from center to bottom. Now form the broad taper on the base, working downhill from the top to the narrow neck and then from the bottom to the neck, as shown *above*.

5 Bore, sand, finish, and part the base

Tools: 1⅝" and 1 1⁄16" Forstner bits, 3⁄16" parting tool.
Tool rest: Parting tool, at center.
Speeds: Drilling, 600 rpm; sanding, 800, 1,500 rpm; finishing and parting, 1,000 rpm.

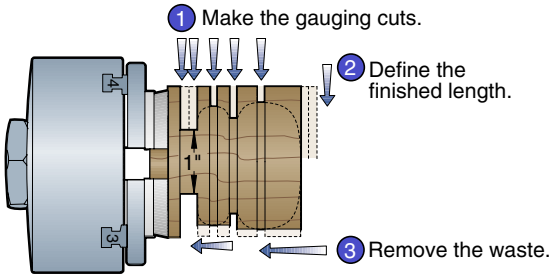


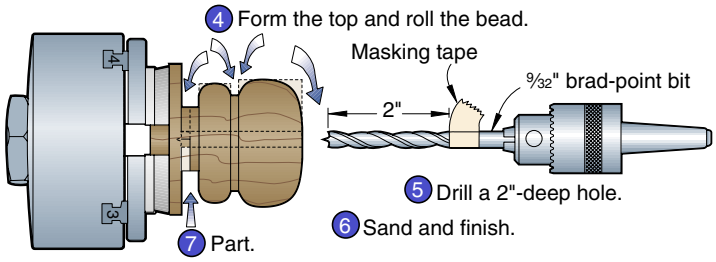
Replace the tail center with a drill chuck. Install a 1⅝" Forstner bit and mark a 3⁄8" drilling depth on it with masking tape. With the lathe running at 600 rpm, drill the counterbore, as shown *above right*. Switch to a 1 1⁄16" Forstner bit and drill a 4 9⁄16"-deep hole, centered in the counterbore. Next, increase the speed to 800 rpm and finish-sand the base, working from 120 grit to 320 grit. Increase the speed to 1,500 rpm and sand lightly with 400-grit sandpaper. Stop the lathe and apply two coats of an oil-polyurethane finish, turning the lathe by hand. Let the finish dry for the time recommended on the can, and wipe off the excess. With the lathe running at 1,000 rpm, buff the finish with a paper towel. Part the base from the waste and set it aside to dry.

6 Form the cap

Tools: 3⁄16" parting tool, ¼" spindle gouge, 9⁄32" brad-point bit.
Tool rest: Parting tool, at center; spindle gouge, slightly below center.
Speeds: Parting tool and spindle gouge, 1,000 rpm; brad-point bit, 800 rpm.

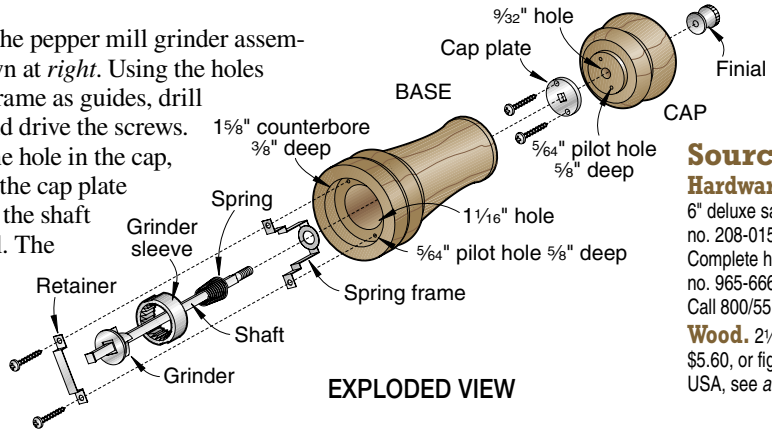
Grip the cap blank spigot with the chuck. Transfer the locations of the critical diameters on the **Cap Template** to the blank. Then use your parting tool to make gauging cuts to the diameters indicated, and mark the finished length of the cap. Now use your spindle gouge to remove most of the waste, forming the two-step blank shown *below left*. Check the 1" diameter of the ⅛"-long cap tenon with calipers. (The tenon loosely fits the 1 1⁄16" hole in the base.) Use your spindle gouge to round the top and form the bead, as shown at *right*. Install a 9⁄32" brad-point bit in the drill chuck and mark a 2" drilling depth with masking tape. Slow the lathe to 800 rpm and drill a 2"-deep hole, where shown *below right*. Finish-sand the cap, apply finish, and part the cap from the waste.





7 Assemble the mill

With the finish dry, insert the pepper mill grinder assembly in the base, where shown at *right*. Using the holes in the retainer and spring frame as guides, drill pilot holes into the base, and drive the screws. Center the cap plate over the hole in the cap, drill pilot holes, and screw the cap plate in place. Slide the cap onto the shaft and secure it with the finial. The salt mill hardware does not include a spring and spring retainer, but installs in the same manner.



EXPLODED VIEW

Written by **Jan Svec** with **Phil Brennion**
Project design: **Jeff Mertz**
Illustrations: **Roxanne LeMoine**

Source

Hardware. 6" deluxe pepper mill no. 365-0006, $9.50; 6" deluxe salt mill no. 365-2006, $8.99; 1⅝" Forstner bit no. 208-0158, $8.99; 1 1⁄16" Forstner bit no. 208-1270, $7.50. Complete hardware kit including one each of the items above no. 965-6666, $29.99 ppd. Craft Supplies USA. Call 800/551-8876, or go to woodturnerscatalog.com.

Wood. 2½x2½x8" turning squares, walnut no. 201-8702, $5.60, or figured maple no. 201-8704, $6.75. Craft Supplies USA, see *above*.

7 keys to successful finishing

These helpful hints will impart to your projects more even color, exquisite grain, and glass-smooth surfaces.

Finishing wood has less to do with big secrets than small details. So we rounded up a handful of finishing facts that are easy to overlook, especially on projects temptingly close to completion. Attend to the details at the finishing stage, however, and you'll create projects people will pay attention to for years to come.

1 Dust you must.

Whether in the air or on your work, dust can destroy a smooth finish. Maybe you can't eliminate the problem, but you can minimize it. With a surface like the one at *right*, start by vacuuming your wood after each sanding grit to remove loose abrasives and fine dust. **Tip:** Use a dusting brush vacuum attachment, *right inset*, rather than a hard nozzle, to prevent marring the surface. Even after the final sanding and vacuuming, dust still has time to accumulate before you apply a film finish. To snag that last-second debris, brush your hand across the wood and allow the natural oils in your fingers to pick up any stray dust. This also reveals rough spots or dust not obvious to your eyes. Perform the same test between coats after scuff sanding and vacuuming your finish.

2 Show off your figure with linseed oil.

What boiled linseed oil lacks as a protective finish, it makes up for as an inexpensive way to enhance wood grain. We rubbed a light coat of it on a curly maple board, shown *above*, to bring out the grain's dramatic rippled look. You can get similar results from tung oil, which goes on slightly lighter and darkens a bit less with age. That small difference will cost you, though. We found linseed oil for $3.50 a pint versus $12 for a pint of tung oil. At average temperature and humidity, give either oil at least a week to dry before applying a film finish. Other options for bringing out grain include Watco Danish Oil and Minwax Antique Oil Finish.

3 Warm and dry beats cool and damp.

Unless your shop stays a constant 72 degrees, temperature and water vapor will affect your finish. Problems range from spray lacquer turning cloudy because of moisture vapor entering the finish to water-based finishes drying too quickly in arid climates, trapping bubbles and brush marks. If possible, postpone finishing until a day when nature cooperates. Otherwise, coping strategies for less-than-perfect conditions include warming your shop in the winter while a finish dries. (Just avoid exposing combustible fumes to open flames or heat sources.) In dry conditions, steam vaporizers and humidifiers adjust indoor humidity to optimum levels. To apply lacquer in mildly humid conditions, add a retarder to spray finishes or use brushing lacquers that dry slowly enough to prevent the finish from clouding.

Application Ranges for Common Finishes

Finish	Temperature F	Humidity
Lacquer	50-90°	25-55%
Oil/Varnish	40-100°	25-55%
Polyurethane	50-90°	25-55%
Shellac*	40-80°	<85%
Water-based	60-100°	25-50%

* Do not apply when temperature is within 10° of the dew point.

4 No strain, no gain.

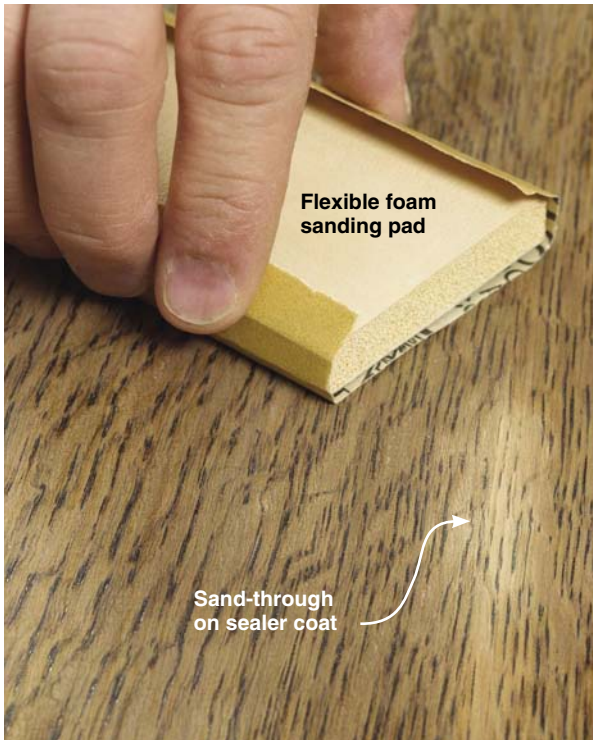
Transferring finish from the original can to another container helps in two ways. First, you're not contaminating your original supply with debris from your brush. Later, when working from a partially full can, strain the finish as you transfer it to filter out debris and congealed clumps created as the finish reacts to oxygen in the can. Cheesecloth or a fine-mesh paint strainer available from many paint stores and home centers will catch most contaminants. When you complete your project, discard the unused portion, along with any dust and bristles it picked up during use.

5 Obey these laws and pause.

Congratulations, your project has reached the finishing stage. But now's no time to abandon the care and patience that's brought you this far. When the can label tells you to let stain dry before finishing, believe it or face the consequences, as shown *above*. Take even greater care with tung and linseed oils used beneath film finishes. When you rush into covering these with a film finish, the oil creates a "bloom" that clouds the finish. Give oils about a week to completely dry, depending on weather conditions. Then allow each coat of finish to dry thoroughly before applying the next.

6 Just a scuff is enough.

Today's super-durable polyurethane finishes don't stick to themselves the way layers of shellac or lacquer bond with previous coats by partially dissolving them. That makes sanding between coats essential. By doing so, you remove dust nibs that become trapped in slow-drying, oil-based finishes. You also leave fine scratches that give the next coat of finish a grip on the one below. Scuff sanding is easy: Just make about four light, uniform passes over the finish using 280-grit abrasive. Check the paper frequently to avoid clumps—called "corns"—that can mar your finish. Use a flexible pad or your hand. A flat, rigid sanding block increases your risk of sanding through the finish at the edges and on uneven spots.



Smoothing off dust nibs after your first coat of finish takes only light pressure on 280-grit abrasive—not enough to cause the sort of sand-through problem shown here.

Scratches made by coarser sandpaper trap more stain pigment than finer scratches, saving you time while creating a darker finish.

7 Forgo fine grits.

If you're sanding up to 320, 400, or even higher grits before adding a film finish, much of that sanding tedium goes to waste. Instead, sand to 150 grit for unstained projects and 180 grit for those receiving a pigment stain. With the time you save, rub out your final layer of film finish using 0000 steel wool or a synthetic substitute. This knocks off any remaining dust nibs and leaves smoother surfaces. With oil finishes, sand the surface to 180 grit before applying the oil, then sand with 400-grit abrasives between coats for a smooth surface.

Written by **Bob Wilson** with **Bob Flexner** and **Alan Noel**

COVER PROJECT

sensational sectional

desk system

This traditionally detailed home-office desk system gives you ultimate layout flexibility. Build only the sections you need and combine them in any number of ways.

Just a few of your options ...

Build the straight desk with an up-top cabinet ... the corner desk alone ... or a full corner sectional.

Home offices can spring up practically anywhere, from a dedicated room to a family room corner, to a bare wall in a bedroom or kitchen. With that in mind, *WOOD*® magazine Design Editor Jeff Mertz created this versatile three-piece desk system to fit all those spaces and do it with a traditional flair. Feel free to mix the straight desk, up-top storage cabinet, and corner desk to suit your needs. Then buy a comfy chair and you're in business.

The desks accommodate either flat-screen or tube monitors (tube monitors require a corner desk), as well as other components. You can also take advantage of special hardware available for storing keyboards, adding pencil drawers, and more. (See *page 32*.)

Note: *The* **Materials List** *on page 54 lists the number of parts to build one straight desk, one corner desk, and one up-top cabinet.*

Start with the legs

1 Plane 1¾"-thick stock (or laminate ¾"-thick stock) to 1½" thick, and cut the legs (A) to the size listed on the **Materials List**. For a tip on wood selection for solid legs, see the **Shop Tip** at *bottom*. Cut four legs for a straight desk and five for a corner desk.

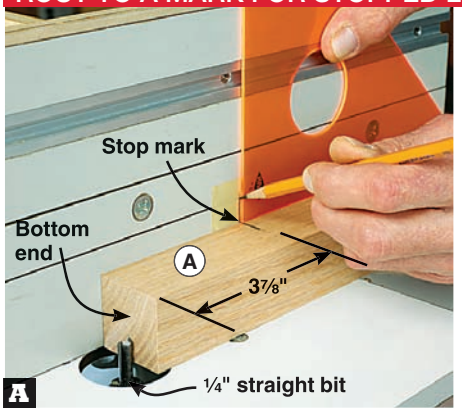
2 To rout a stopped groove in each leg, where shown on **Drawing 1**, chuck a ¼" straight bit in your table-mounted router, and adjust it to cut ⅜" deep. Position the fence to center the bit on the thickness of the legs. Then mark the location of the end of the groove on one leg, 3⅞" from the bottom. Now make a stop mark on the fence, as shown in **Photo A**, and rout the stopped grooves, as shown in **Photo B**.

Note: *For the corner desk, set aside one leg for the rear corner, and do not rout a groove or form mortises in it.*

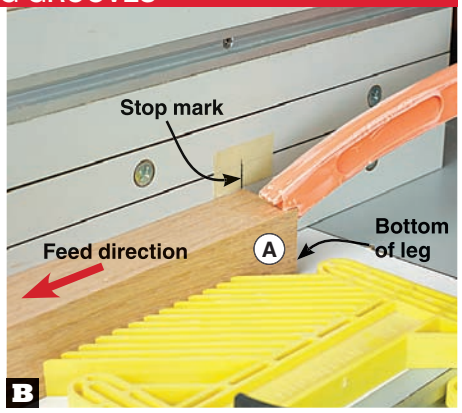
3 To form the leg mortises, chuck a ¼" brad-point bit in your drill press and position the fence to align the bit with the leg grooves. Set the depth stop to drill 13⁄16" deep. Now drill overlapping holes to form mortises, where shown on **Drawing 1**. Smooth the sides and square the ends of the mortises with a chisel.

4 Before forming the leg bottom-end tapers, arrange them in pairs with the grooves facing. Then "pair the pairs" for right- and left-hand end assemblies. Mark the positions (RF, RR, LF, LR) on the tops of the legs. Now, near the bottom of each leg, mark the grooved and inside faces for tapers, where shown on **Drawing 2**. Retrieve the rear corner leg for the corner desk, and mark two adjacent faces. Draw the tapers, where dimensioned on **Drawing 1**, and bandsaw

ROUT TO A MARK FOR STOPPED LEG GROOVES

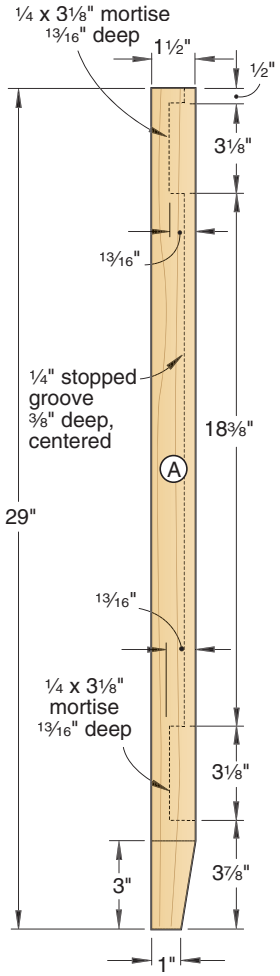


With the end of the leg (A) against the right side of the bit, transfer the leg groove stop mark to a piece of masking tape on the fence.



Starting from the top end of each leg (A), rout the grooves, stopping when the bottom of the leg aligns with the mark on the fence.

1 LEG

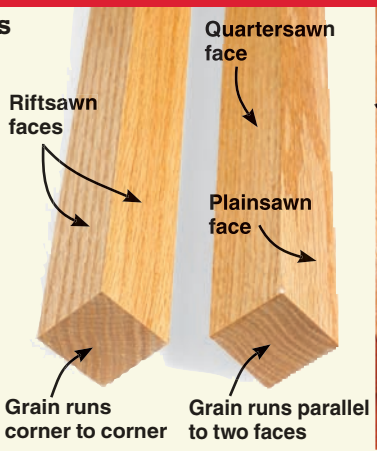


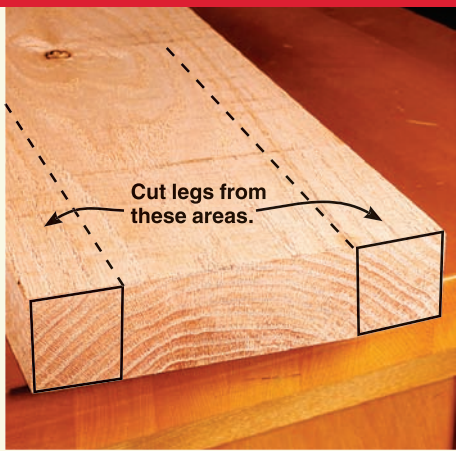
SHOP TIP

Great-lookin' legs from ordinary boards

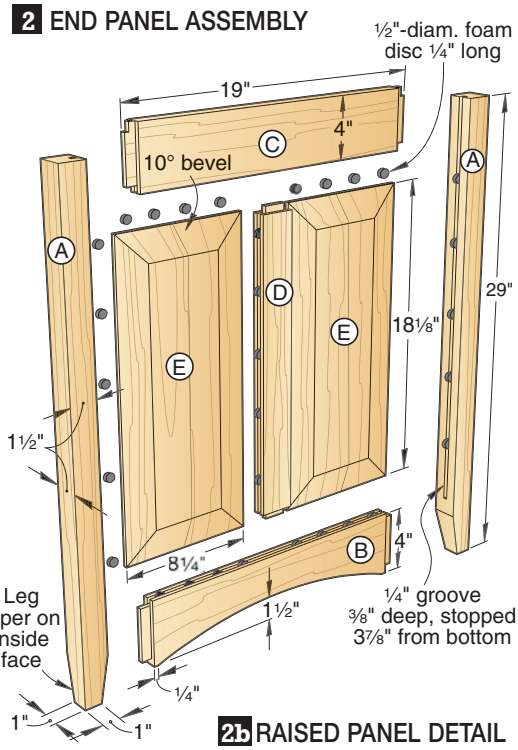
Stock selection makes a big difference in the appearance of solid-wood legs. In the photo *near right*, the grain in the right-hand leg runs parallel to two faces. The leg displays *quartersawn* pattern on two faces and *plainsawn* pattern on the other two. This leg does not look good where adjacent faces are visible. In the left-hand leg, the grain runs corner to corner, parallel to one of the diagonals. The leg displays straight *riftsawn* pattern on all four faces. This leg looks good from any angle.

You don't have to buy special stock to get the right grain orientation. Most boards display rift grain at the edges and plain grain in the middle. Cut your legs from the edges, as shown *far right*, to get legs with four good faces.

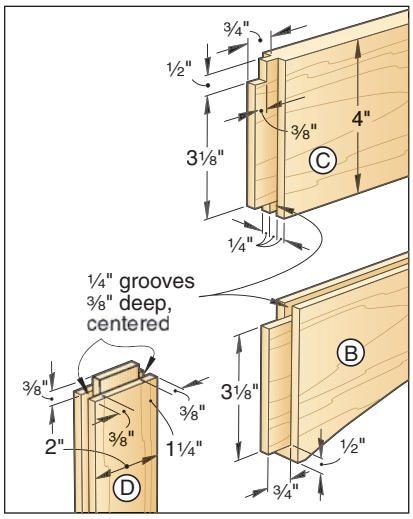




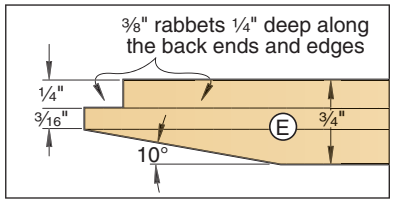
2 END PANEL ASSEMBLY



2a TENON DETAILS



2b RAISED PANEL DETAIL



them, staying about 1/16" to the waste side of the line. Make the sanding jig shown on **Drawing 3**, clamp it to your disc sander, and sand the tapers, as shown in **Photo C**. Finish-sand the legs.

Make the base end panels

1 From ¾"-thick stock, cut the lower side rails (B), upper side rails (C), and muntins (D) to size. With a ¼" dado blade in your tablesaw, cut centered ⅜"-deep grooves in one edge of the rails and both edges of the muntins, where shown on **Drawing 2a**. Leave the dado blade in place.

2 To form haunched tenons on the upper side rails (C), where shown on **Drawing 2a**, raise the dado blade to make a ½"-deep cut. For a stop, position the rip fence ⅛" from the right side of the blade. To back the cuts, attach an auxiliary extension to the miter gauge so the end just clears the fence. Now cut ⅜"-wide notches ½" deep in both ends of each rail, as shown in **Photo D**. Reposition the fence ½" from the right side of the blade. With the lower side rail (B) on edge and the groove facing up, cut ¾"-wide notches ½" deep in both ends of each rail. Do not move the fence.

3 To form the tenon cheeks, lower the dado blade to cut ¼" deep. First testing the cuts on scrap of the same thickness as the rails for a snug fit in the mortises, finish the tenons, as shown in **Photo E**.

4 Reposition the fence ⅛" from the right side of the dado blade, and cut tenons on the ends of the muntins (D).

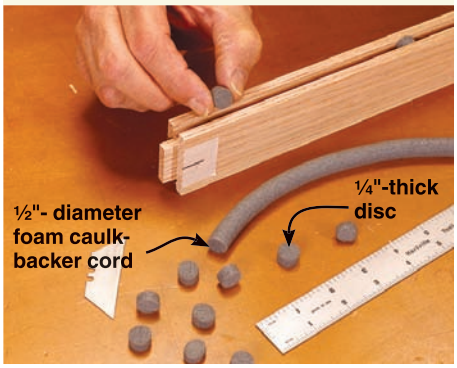
5 Lay out the endpoints and centerpoint of the arch on each lower side rail (B), where shown on **Drawing 2**. Connect the points with a fairing stick, and draw the arches. Bandsaw and sand them to shape. Finish-sand the muntins and rails.

SHOP TIP

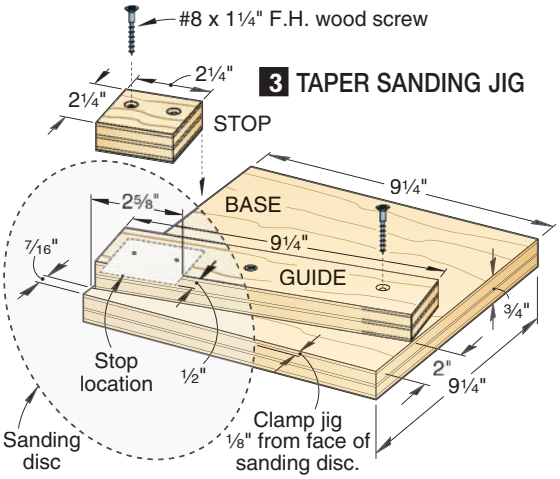
A low-tech method for keeping floating panels centered

In frame-and-panel construction, solid-wood panels must be installed without glue to allow for seasonal movement. To allow that, and keep panels centered in the frames, commercial cabinet shops insert special neoprene rubber balls in the frame grooves. Here's an inexpensive method that works just as well.

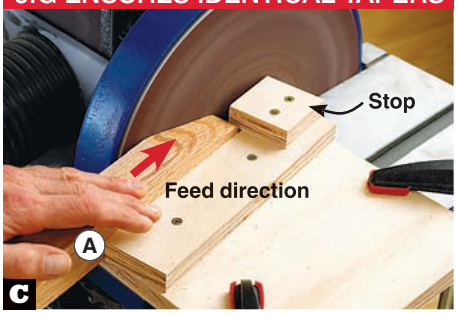
Buy a coil of ½"-diameter foam caulk-backer cord at a hardware store or home center. Slice ¼"-thick discs, and place them into the frame-member grooves, as shown *below*, four at the top and bottom of each panel and five at each side. Now glue only the frame mortises and tenons and clamp the assembly. The foam discs compress, centering the panel allowing for future movement.



3 TAPER SANDING JIG

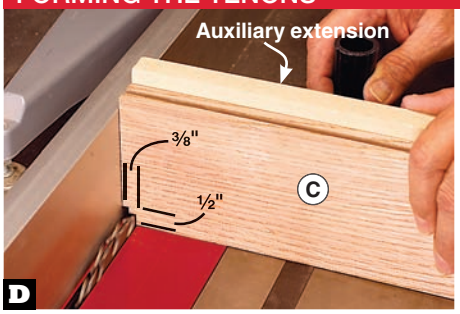


JIG ENSURES IDENTICAL TAPERS

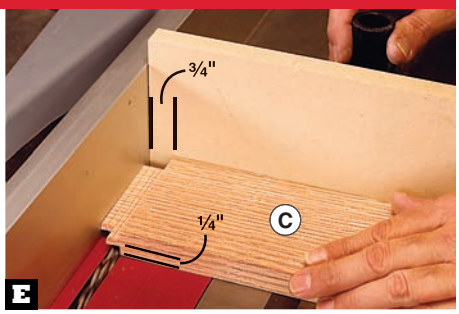


Clamp the jig to your sander with ⅛" between the jig base and the disc. Feed the leg (A) into the jig until the end contacts the stop.

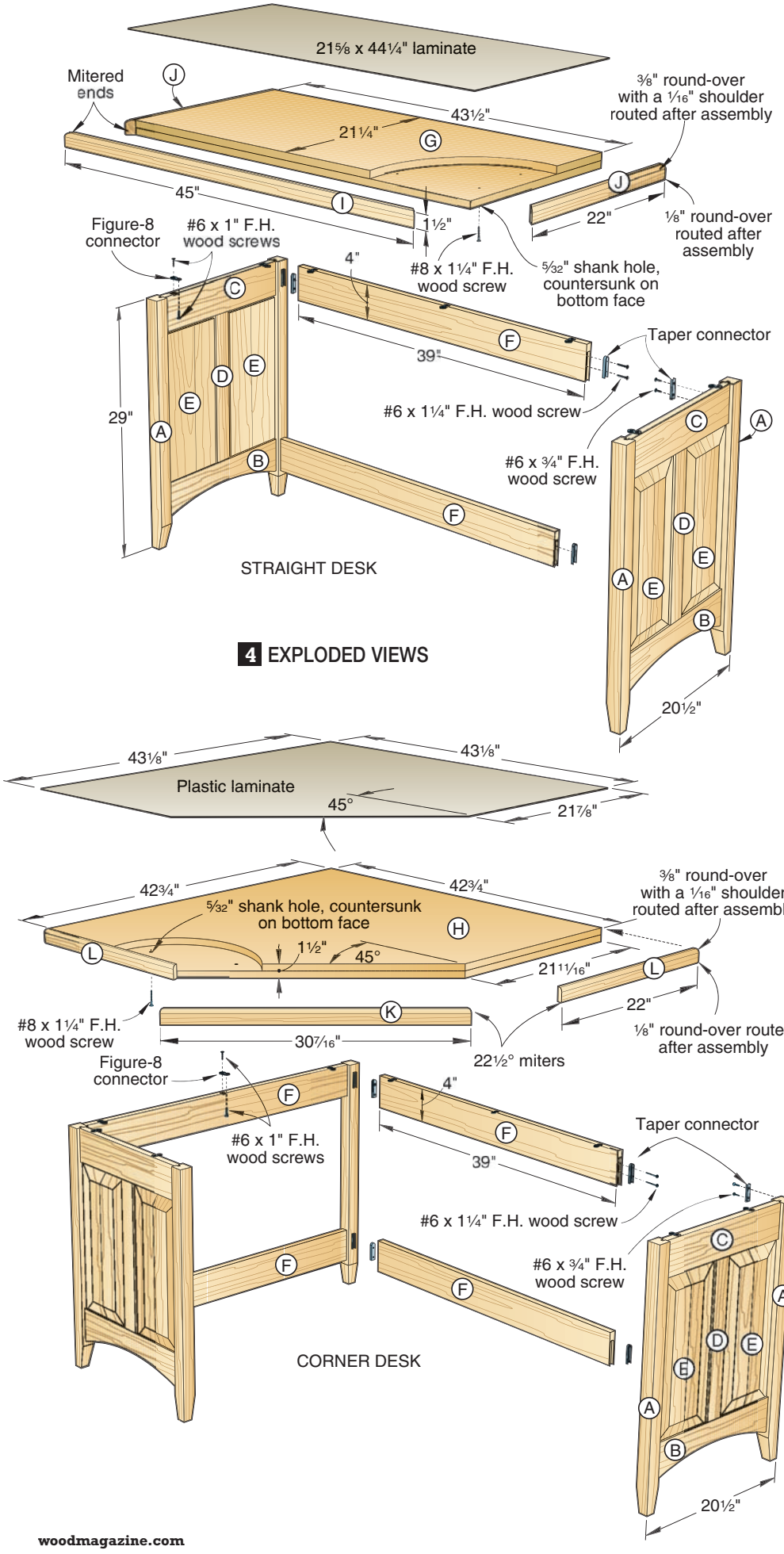
FORMING THE TENONS



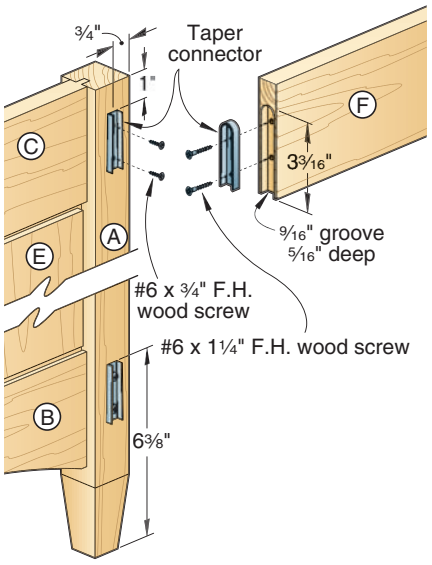
With the upper side rail (C) groove facing up, start at the end and cut the tenon haunches in several passes, using the fence as a stop.



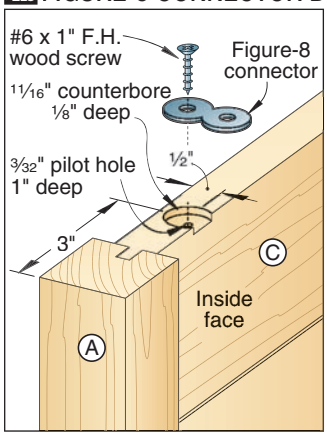
Laying the side rails (B, C) flat, cut the tenon cheeks. Start at the end and make several passes, using the fence as a stop.



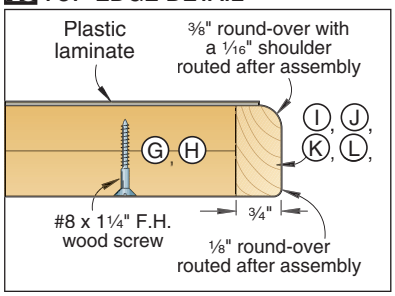
4a TAPER CONNECTOR DETAIL



4b FIGURE-8 CONNECTOR DETAIL



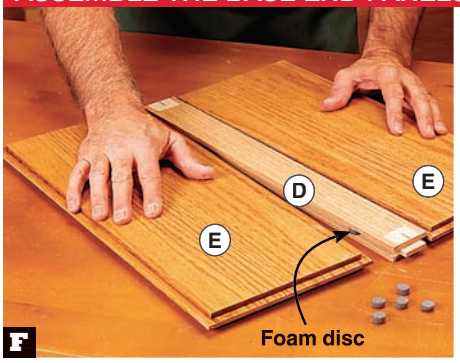
4c TOP EDGE DETAIL



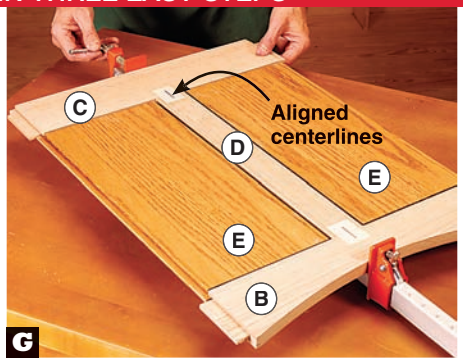
6 Edge-join ¾"-thick stock for the panels (E), and cut them to size. To make the plain beveled raised panels shown on **Drawing 2b** on your tablesaw, see *page 60*. Then cut ⅜" rabbets ¼" deep along the back ends and edges of the panels. To prevent seasonal wood movement from exposing unfinished wood, finish-sand and stain the panels. (We applied Varathane no. 206 Summer Oak stain, following the directions on the can.)

7 Before assembling the base end panels, apply masking tape to the inside faces of the rails (B, C) and the muntins

ASSEMBLE THE BASE END PANELS IN THREE EASY STEPS



With the muntin (D) centerlines facing up, place five foam discs in each muntin groove, and slide in the panels (E), bevels down.

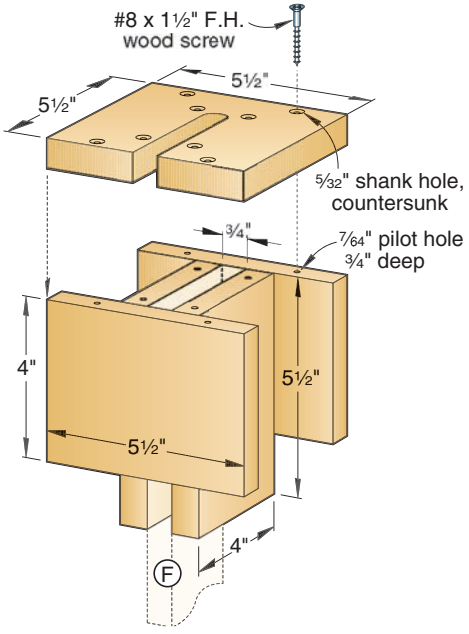


Insert eight foam discs in each rail (B, C) groove. Apply glue to the muntin (D) tenons and add the rails, aligning the centerlines.

Spread glue in the leg (A) mortises, and with end tapers facing up, clamp the legs in place. Center the panels with a putty knife.

(D), and mark centerlines where the rails and muntins meet. Now start assembly by mating the panels (E) and muntins, as shown in **Photo F**. See the **Shop Tip** on *page 48* for a way to keep the floating panels centered.

5 MORTISE-ROUTING JIG



Add the rails, as shown in **Photo G**. Finally, insert five foam discs in each leg (A) groove, and glue and clamp the legs in place, as shown in **Photo H**.

Now for the base rails

1 Cut the base rails (F) to size. You'll need two for a straight desk, and four for a corner desk.

2 To rout taper-connector mortises in the ends of the rails, where shown on **Drawings 4** and **4a**, first make the mortise-routing jig shown on **Drawing 5**. To make the jig, cut one ¾×5½×5½" top and four ¾×4×5½" sides from plywood, particleboard, or MDF. Photocopy the template pattern on the *WOOD Patterns®* insert, and adhere it to the top piece with spray adhesive. Drill an 11/16" hole and countersunk 5/32" shank holes, where indicated on the pattern. Now form an 11/16"-wide slot, as shown in **Photo I**.

3 Clamp a base rail (F) between two sides, flush at the edges and one end. Then clamp the other two sides and the top in place, where shown on **Drawing 5**. Make sure the top slot is centered on the end of the rail. Using the shank holes in the top as guides, drill pilot holes into the sides, and drive the screws.

4 Chuck a ⅜" straight bit into your handheld router, and install a ½"-outside-diameter guide bushing in the base. Adjust the bit to cut 5/16" deep into the ends of the base rails (F). Insert the rails in the mortise routing jig and rout taper-connector mortises in both ends, as shown in **Photo J**. (You'll cut a 5/16"-deep notch in the jig when routing the first rail.) Make sure the open ends of both mortises face the same direction. Finish-sand the rails.

5 To mount figure-8 connectors on the top edges of the upper rails (C) and base rails (F), mark the centers and drill the mortises with an 11/16" Forstner bit, where shown on **Drawings 4** and **4b**.

Laminate the desktops

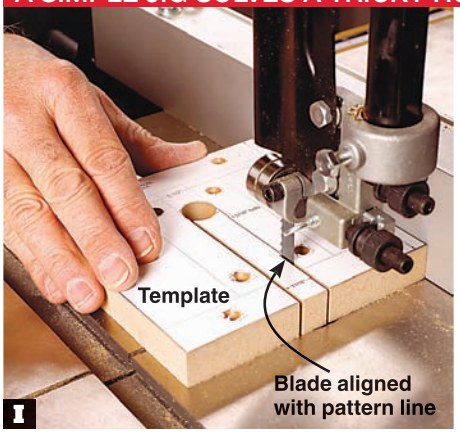
1 From ¾" medium-density fiberboard, cut two pieces for the straight top (G) to size and two pieces for the corner top (H) to size and the shape shown on **Drawing 4**. Apply glue with a short-nap paint roller, and clamp the layers together, keeping the ends and edges flush. Drill countersunk screw holes through the lower layer and into the upper layer, and drive the screws.

2 Cut the straight top front trim (I), straight top side trim (J), corner top front trim (K), and corner top side trim (L) to the thickness and width and 1" longer than the lengths listed. Miter-cut the straight top front trim (I) and corner top front trim (K) to length, where shown on **Drawing 4**, and glue and clamp the trim in place. Miter the front ends of the straight top side trim (J) and corner top side trim (L). Dry-fit the side trim and mark the rear ends flush with the rear edges of the tops. Cut the side trim to length, and glue and clamp it in place.

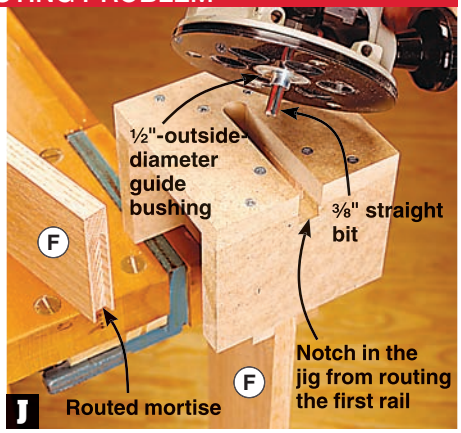
3 With the glue dry, sand the trim flush with the top and bottom surfaces of the tops. Chuck a ⅛" round-over bit into your handheld router, and rout the trim bottom front edges, where shown on **Drawing 4c**.

4 Cut plastic laminate ½" larger in width and length than the tops. Center the corner top laminate on the corner top and mark

A SIMPLE JIG SOLVES A TRICKY ROUTING PROBLEM



Position your bandsaw fence to align the blade with the template pattern line, and saw along the lines into the 11/16" hole.



Clamp a base rail (F) and jig in your bench vise. Running the guide bushing along the template slot edge, rout a 5/16"-deep mortise.

and trim the laminate to overhang the front edge of the top by ¼". To learn how to adhere and trim the laminate, including forming the ⅜" round-over along the upper edges of the tops, see *page 14*. Finish-sand the trim.

Build the case

1 Cut the sides (M), top and bottom (N), and dividers (O) to size. With a ¾" dado blade in your tablesaw, cut a ⅜"-deep rabbet and ⅜"-deep dado in each side (M), where shown on **Drawing 6**. Then cut dadoes in the top and bottom (N).

2 Chuck a ¼" rabbet bit in your handheld router, and making sure you have mirror-image parts, rout ⅜"-deep rabbets along the inside back edges of the sides (M), where shown on **Drawing 6**. Then rout rabbets along the back edges of the top and bottom (N), where shown on **Drawings 6** and **7**.

3 Using a ¼" brad-point bit and a depth stop, drill ¼" holes ⅜" deep in the sides and ¼" holes through the dividers, where shown on **Drawing 6**. To prevent tear-out when drilling through the dividers, drill into a scrap backer board. (Note that the dividers fit into a ⅜"-deep rabbet in the top, accounting for the ⅜" difference in the location of the holes.) For proper assembly later, mark the top ends of the dividers.

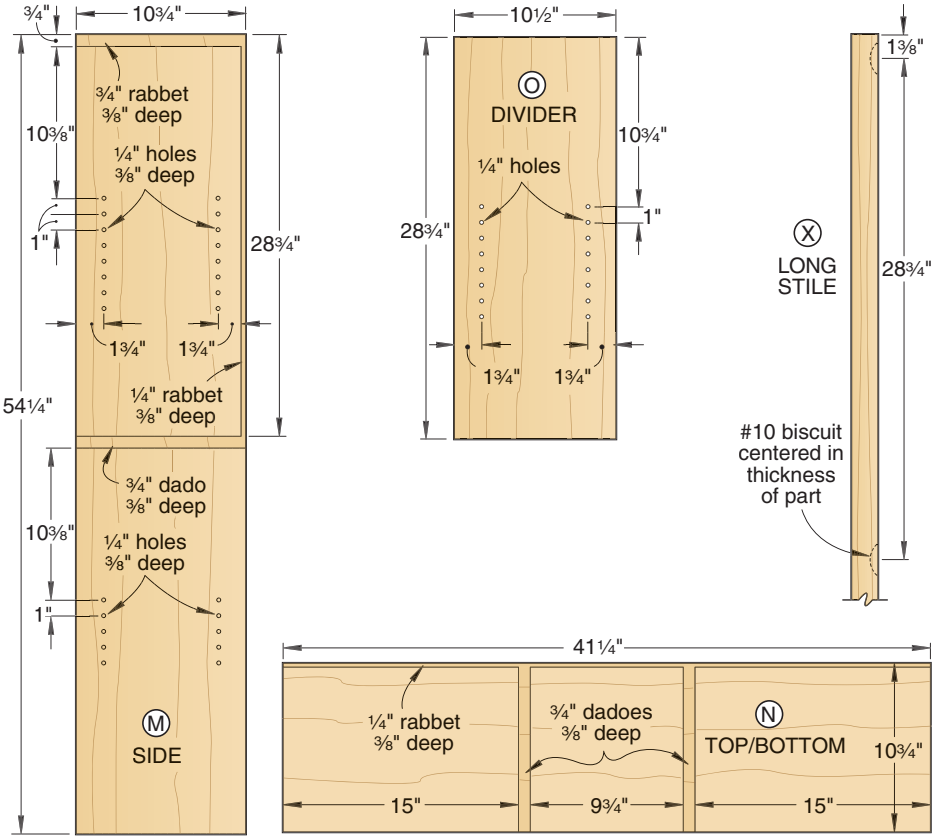
4 Spread glue in the top and bottom (N) dadoes, and clamp the dividers (O) between them, keeping the front edges flush. Then spread glue in the side (M) rabbets and dadoes, and clamp them to the top/bottom/divider assembly, once again keeping the front edges flush. Check the assembly for square by measuring the diagonals, and let the glue dry.

5 Check the dimensions of the rabbeted opening for the back (P), and cut it to size. Finish-sand the back and set it aside.

6 Cut the short shelves (Q), medium shelves (R), and long shelf (S) to size. Cut the short trim (T), medium trim (U), and long trim (V) to size. Glue and clamp the trim to the shelves. With the glue dry, sand the trim flush with the shelves. Chuck a ⅛" round-over bit in your handheld router and rout the bottom edge of the trim, where shown on **Drawing 7a**. Switch to a ⅜" round-over bit, and rout a round-over with a 1/16" shoulder along the top front edge of the trim. Finish-sand the shelves.

7 Cut the long shelf rails (W) to size and finish-sand them. Glue and clamp the rails to the long shelf (S/V), where shown on **Drawings 7** and **7a**.

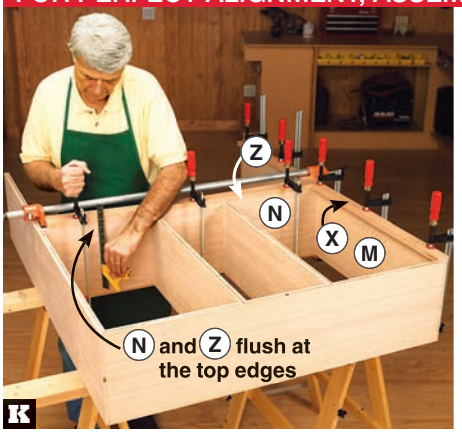
6 CASE PARTS



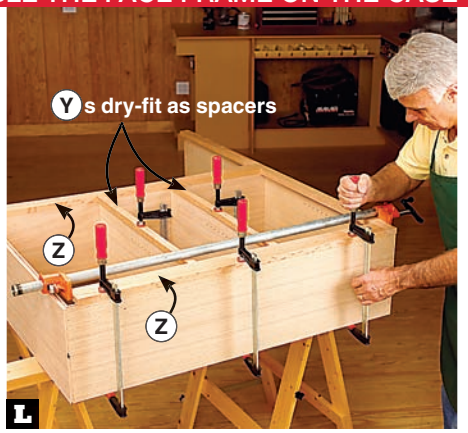
Add face frame and crown

1 Cut the long stiles (X) and short stiles (Y) to size. Clamp the long stiles to the case, flush at the outside edges. Checking the distance between the long stiles, cut the rails (Z) to size. Dry-assemble the face frame in the configuration shown on **Drawing 7**, and mark biscuit-slot centerlines on the long stiles, where shown on **Drawing 6**. Then

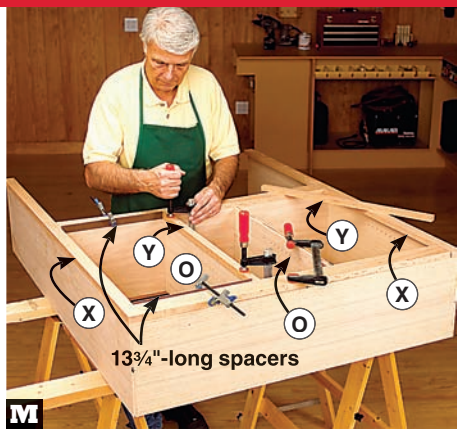
FOR PERFECT ALIGNMENT, ASSEMBLE THE FACE FRAME ON THE CASE



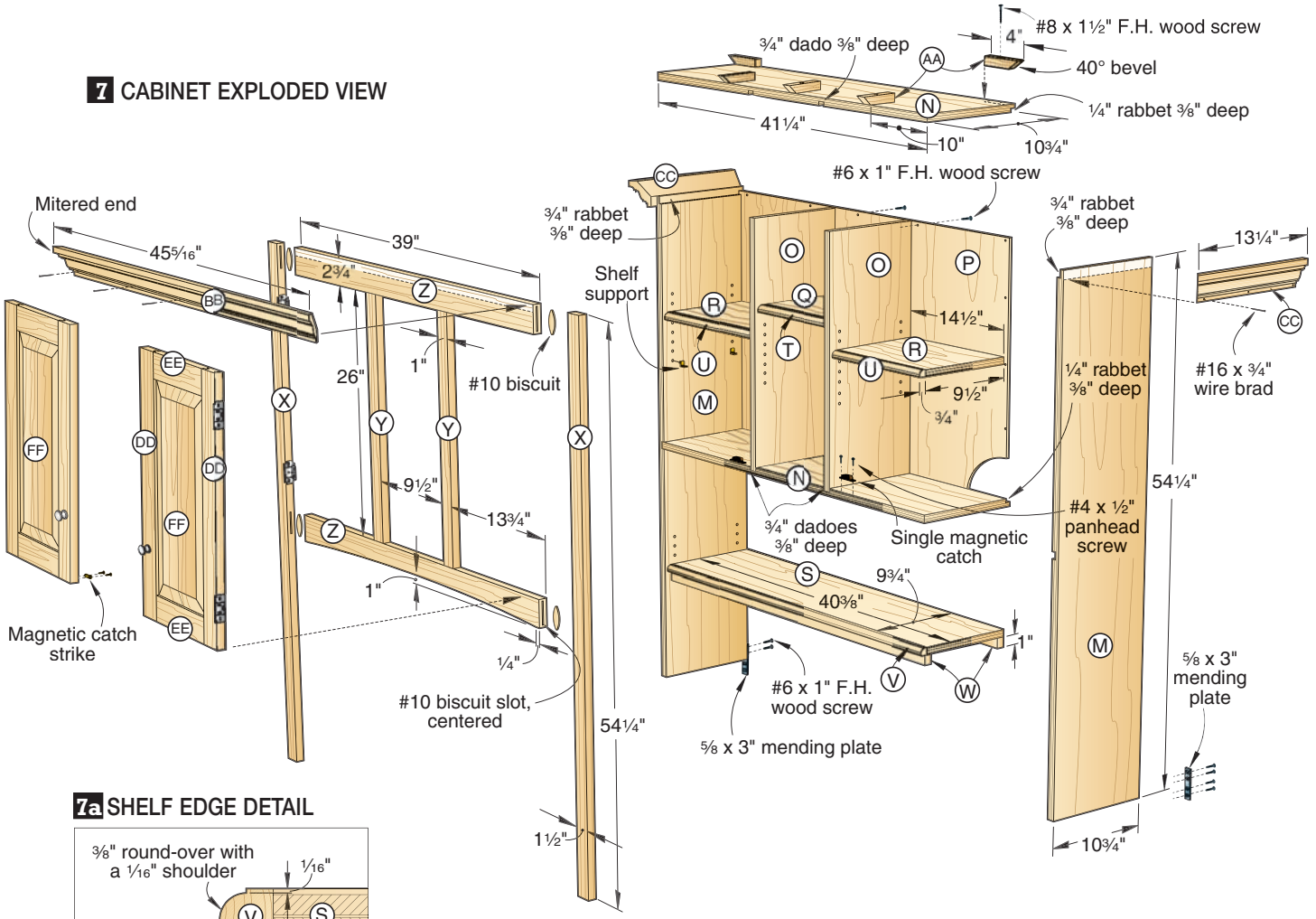
Glue, biscuit, and clamp the lower rail (Z) in place, keeping the top edge of the rail flush with the top face of the bottom (N).

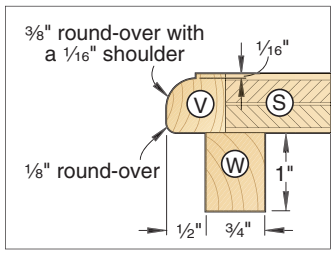


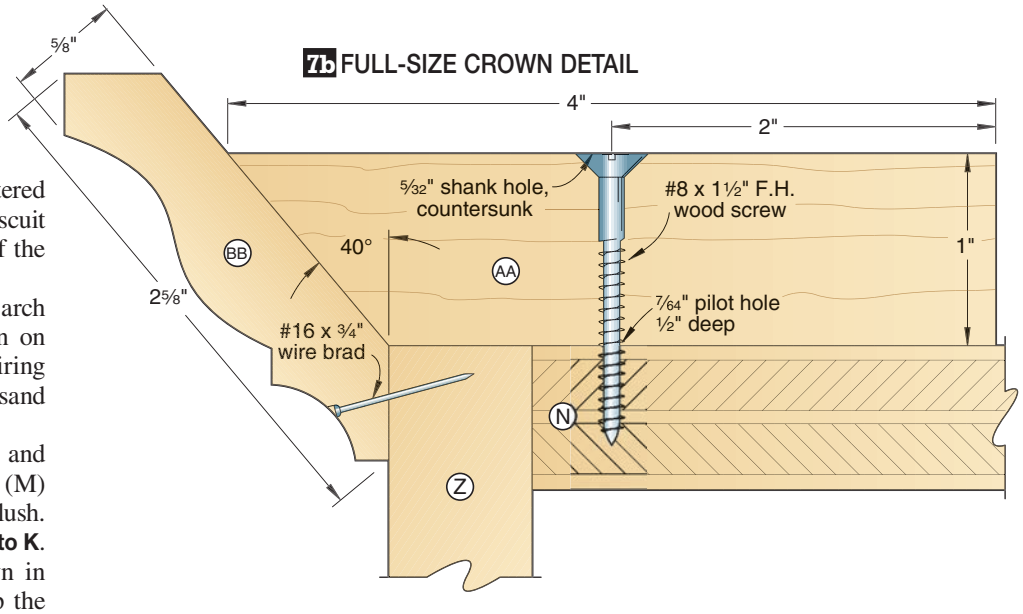
Insert the short stiles (Y) as spacers between the upper and lower rails (Z). Then glue and clamp the upper rail in place.



Inserting 13¾"-long spacers between the long stiles (X) and short stiles (Y), glue and clamp the short stiles to the dividers (O).







mark mating biscuit-slot centerlines centered on the ends of the rails. Adjust your biscuit joiner to center slots in the thickness of the parts, and cut slots for #10 biscuits.

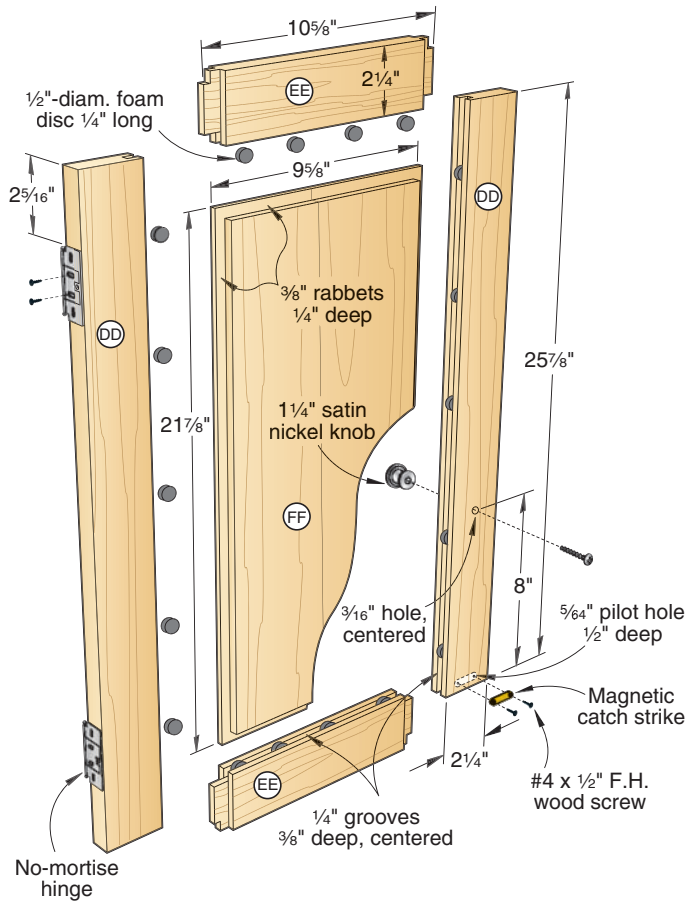
2 Mark the ends and midpoint of the arch in the lower rail (Z), where shown on **Drawing 7**. Connect the points with a fairing stick, and draw the arch. Bandsaw and sand it to shape.

3 Set the case on sawhorses. Glue and clamp one long stile (X) to one side (M) with the outside edges and bottom ends flush. Add the lower rail (Z), as shown in **Photo K**. Then add the upper rail (Z), as shown in **Photo L**. Next glue, biscuit, and clamp the other long stile in place. Finally, add the short stiles (Y), as shown in **Photo M**. With the glue dry, finish-sand the face frame.

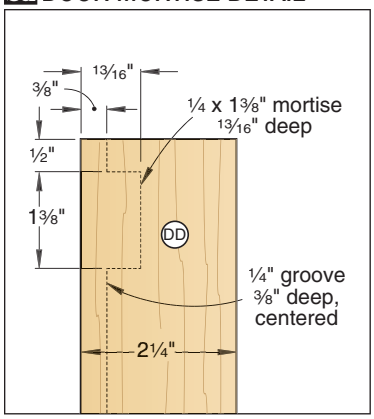
4 Cut the crown cleats (AA) to size, cut the ends at an angle, where shown on **Drawing 7b**, and drill countersunk shank holes. (The drawing shows a full-size profile of the molding used in this project. The profile, overall size, and spring angle of crown molding available at your lumberyard or home center may vary. Be sure to match the cleat angle cut with the spring angle of your crown molding.) Now glue and clamp the cleats in place, where shown on **Drawings 7** and **7b**. Using the cleat holes as guides, drill pilot holes into the top (N), and drive the screws.

5 From 2⅝" crown molding, cut the front crown (BB) and side crowns (CC) 2" longer than the lengths listed. Miter-cut the front crown so the heel-to-heel dimension matches the outside width of the case. Glue

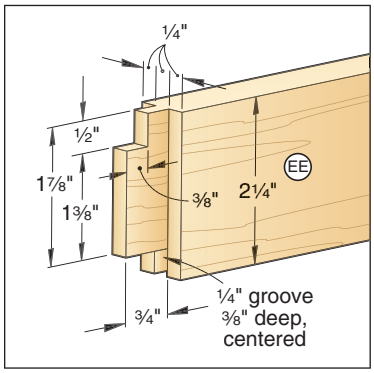
8 DOOR (Viewed from back)



8a DOOR MORTISE DETAIL



8b DOOR HAUNCHED TENON DETAIL



and nail the front crown to the face frame with #16×¾" wire brads, positioning it where shown on **Drawing 7b**. Miter-cut the front ends of the side crowns and dry-fit them, temporarily securing the miters with masking tape. Mark the lengths flush with the rear edges of the sides (M). Trim the side crowns to length, and glue and nail them in place. Set the brads and fill the holes. With the filler dry, finish-sand the crown.

Make raised-panel doors

1 Cut the door stiles (DD) and door rails (EE) to size. With a ¼" dado blade in your tablesaw, cut centered ⅜"-deep grooves in the parts, where shown on **Drawing 8**. Leave the ¼" dado blade in place.

2 To form the stile mortises, chuck a ¼" brad-point bit in your drill press and position the fence to align the bit with the stile grooves. Set the depth stop to drill 13⁄16" deep. Now drill overlapping holes to form mortises, where shown on **Drawing 8a**. Smooth the sides and square the ends of the mortises with a chisel.

3 To form haunched tenons on the door rails (EE), where shown on **Drawings 8** and **8b**, return to the tablesaw with the ¼" dado blade. For a stop, position the rip fence ⅛" from the right side of the blade. To back the cuts, attach an auxiliary extension to the miter gauge so the end just clears the fence. Now raise the blade, and with the rails on edge and the grooves facing up, cut ⅜"-wide notches ½" deep in both ends of each rail.

4 To form the tenon cheeks, reposition the fence ½" from the right side of the blade. Lower the dado blade to cut ¼" deep. First testing the cuts on scrap of the same thickness as the rails for a snug fit in the mortises, lay the rails flat, and cutting on both sides, finish the tenons.

5 Edge-join ¾"-thick stock for the door panels (FF), and cut them to size. Make the raised door panels in the same manner as the desk end assembly panels (E). Then cut ⅜" rabbets ¼" deep along the back ends and edges of the panels. Finish-sand and stain the panels.

6 Insert five foam discs in each door stile (DD) groove and four in each door rail (EE) groove, where shown on **Drawing 8**. Capture the panel (FF) ends in the rail grooves, apply glue to the rail tenons, and clamp the stiles in place. Make sure the stile ends and rail edges are flush, and that the doors are square and flat. Use a putty knife to center the panels in the frames. With the glue dry, drill knob holes in the stiles, and finish-sand the frames.

7 Fasten the knobs to the doors. Then to mount the hinges on the doors, hang the doors in the face-frame openings, and install the catches, where shown on **Drawings 7** and **8**, see the article on *page 68*.

Finish and assemble

1 Remove the hardware. Inspect all the parts, and resand where needed. Cover the plastic laminate on the desktops with newspaper, fastening it along the edges with masking tape. Apply stain to all the parts and let it dry for 24 hours. Apply a clear finish. (We sprayed on three coats of AquaZar satin water-based polyurethane, sanding between coats with 220-grit sandpaper.)

2 Position the taper connectors on the legs (A) and base rails (F), where shown on **Drawing 4a**. Drill pilot holes, and screw the connectors in place. Mount connectors on the rear corner leg of the corner desk in the

same positions on the two adjacent faces that have tapers at the bottom.

3 Carry the parts to the location you've selected for the desk, and assemble the base end panels, rear corner leg, and base rails by interlocking the taper connectors. Screw the figure-8 connectors in place. Center the tops side-to-side on the bases with the rear edges flush with the backs of the legs. Using the holes in the figure-8 connectors as guides, drill pilot holes into the bottom faces of the desktops, and drive the screws. Place the corner desk in the corner.

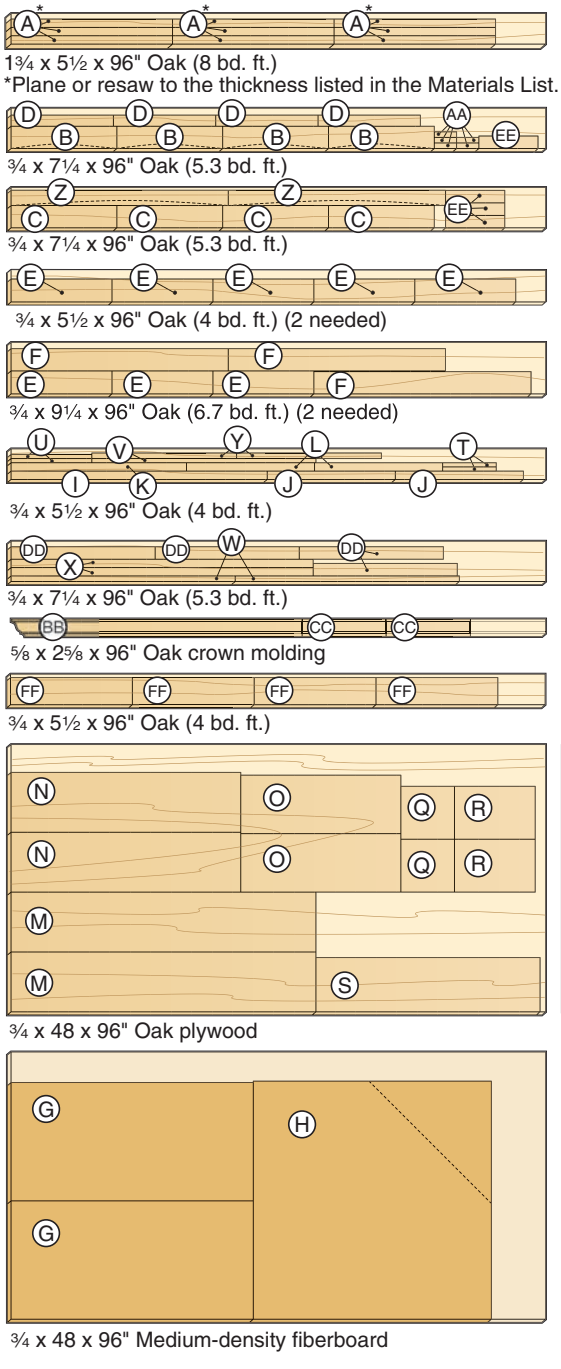
4 Place the back (P) in the cabinet rabbeted opening. Drill countersunk screw holes through the back and into the sides (M), top and bottom (N), and dividers (O), where shown on **Drawing 7**. Screw the back in place with #6×1" flathead wood screws.

5 Place the cabinet on the straight desk, centered side-to-side and flush with the rear edge of the desktop. Position mending plates on the rear edges of the cabinet sides (M). Drill pilot holes into the sides and the rear edge of the desktop and drive the screws. Move the straight desk against the wall and corner desk.

6 Install the shelf supports and shelves. Reinstall the knobs and hinges and rehang the doors. Reinstall the catches. You're done—now pull up your desk chair and enjoy.

Written by **Jan Svec** with **Chuck Hedlund**
Project design: **Jeff Mertz**
Illustrations: **Roxanne LeMoine**

Cutting Diagram


A
1¾ x 5½ x 96" Oak (8 bd. ft.)
*Plane or resaw to the thickness listed in the Materials List.
D B AA EE
¾ x 7¼ x 96" Oak (5.3 bd. ft.)
Z C EE
¾ x 7¼ x 96" Oak (5.3 bd. ft.)
E
¾ x 5½ x 96" Oak (4 bd. ft.) (2 needed)
F E
¾ x 9¼ x 96" Oak (6.7 bd. ft.) (2 needed)
U V Y L T I K J
¾ x 5½ x 96" Oak (4 bd. ft.)
DD X W
¾ x 7¼ x 96" Oak (5.3 bd. ft.)
BB CC
⅝ x 2⅝ x 96" Oak crown molding
FF
¾ x 5½ x 96" Oak (4 bd. ft.)
N O Q R M S
¾ x 48 x 96" Oak plywood
P
¼ x 48 x 48" Oak plywood
G H
¾ x 48 x 96" Medium-density fiberboard
H
¾ x 48 x 48" Medium-density fiberboard

Materials List

		FINISHED SIZE T	W	L	Matl.	Qty.
Desk bases						
A	legs	1½"	1½"	29"	O	9
B	lower side rails	¾"	4"	19"	O	4
C	upper side rails	¾"	4"	19"	O	4
D	muntins	¾"	2"	18⅜"	O	4
E*	panels	¾"	8¼"	18⅛"	EO	8
F	base rails	¾"	4"	39"	O	6
Desktops						
G	straight top	1½"	21¼"	43½"	LMDF	1
H	corner top	1½"	42¾"	42¾"	LMDF	1
I*	straight top front trim	¾"	1½"	45"	O	1
J*	straight top side trim	¾"	1½"	22"	O	2
K*	corner top front trim	¾"	1½"	30⅞"	O	1
L*	corner top side trim	¾"	1½"	22"	O	2
Up-top cabinet case						
M	sides	¾"	10¾"	54¼"	OP	2
N	top and bottom	¾	10¾"	41¼"	OP	2
O	dividers	¾"	10½"	28¾"	OP	2
P	back	¼"	41¼"	28¾"	OP	1
Q	short shelves	¾"	9½"	9⅝"	OP	2
R	medium shelves	¾"	9½"	14½"	OP	2
S	long shelf	¾"	9¾"	40⅜"	OP	1
T	short trim	¾"	¾"	9⅝"	O	2
U	medium trim	¾"	¾"	14½"	O	2
V	long trim	¾"	¾"	40⅜"	O	1
W	long shelf rails	¾"	1"	40⅜"	O	2
Cabinet face frame and crown						
X	long stiles	¾"	1½"	54¼"	O	2
Y	short stiles	¾"	1"	26"	O	2
Z	rails	¾"	2¾"	39"	O	2
AA	crown cleats	¾"	1"	4"	O	5
BB*	front crown	⅝"	2⅝"	45⅝6"	OC	1
CC*	side crowns	⅝"	2⅝"	13¼"	OC	2
Cabinet doors						
DD	door stiles	¾"	2¼"	25⅞"	O	4
EE	door rails	¾"	2¼"	10⅝"	O	4
FF*	door panels	¾"	9⅝"	21⅞"	EO	2

*Parts initially cut oversize. See the instructions.

Materials key: O–oak, EO–edge-joined oak, LMDF–laminated medium-density fiberboard, OP–oak plywood, OC–oak crown molding.

Supplies: #4x½", #6x¾", #6x1", #6x1¼", #8x1¼", #8x1½" flathead wood screws; #4x½" panhead screws; #16x¾" wire brads; #10 biscuits; 48x96" Wilsonart Majestic Topaz no. 4586-07 plastic laminate; contact adhesive; ⅝x3" mending plates, masking tape, spray adhesive, ½"-diameter foam caulk-backer cord.

Blades and bits: Stack dado set; ¼" brad-point drill bit; 11/16" Forstner bit; ¼" rabbet, ¼" straight, ⅜" straight, ⅛" round-over, and ⅜" round-over router bits; ½"-outside-diameter router guide bushing.

Source

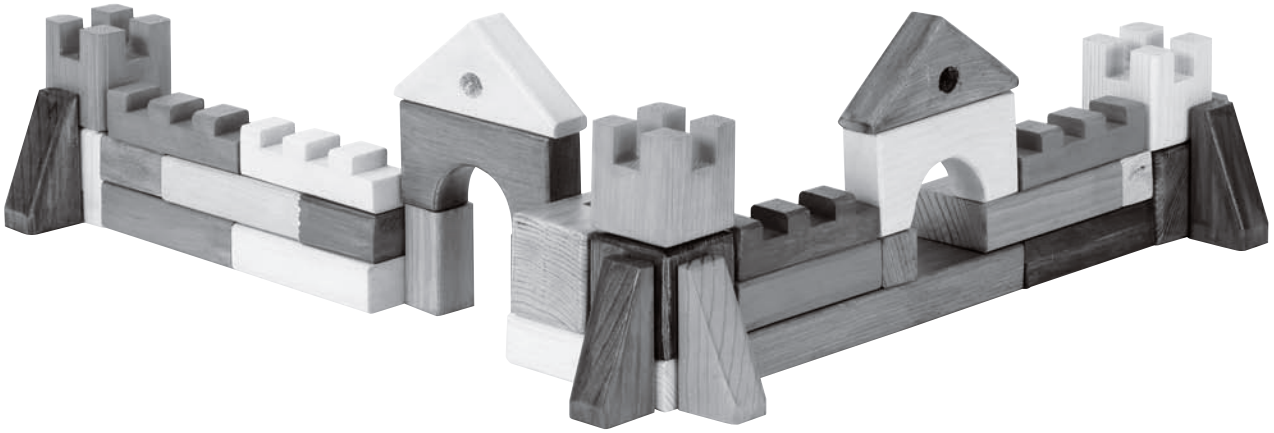
Hardware. Satin nickel ball-tip no-mortise hinges no. 02H12.52, $5.80 pr. (2 pr.); brass magnetic catch no. 01L05.20, $2.20 (2); satin nickel knobs no. 02W26.62, $3.15 (2); 2" taper connectors no. 00S13.02, $1.85 pr. (6 pr.); figure-8 connectors no. 13K01.50, $1.90 pack of 20 (1); shelf supports no. 94Z04.02, $3.50 pack of 50 (1).
Lee Valley. Call 800/871-8158, or go to leevalley.com.

Better Homes and Gardens®
WOOD® PATTERNS®
September 2005 Issue 164

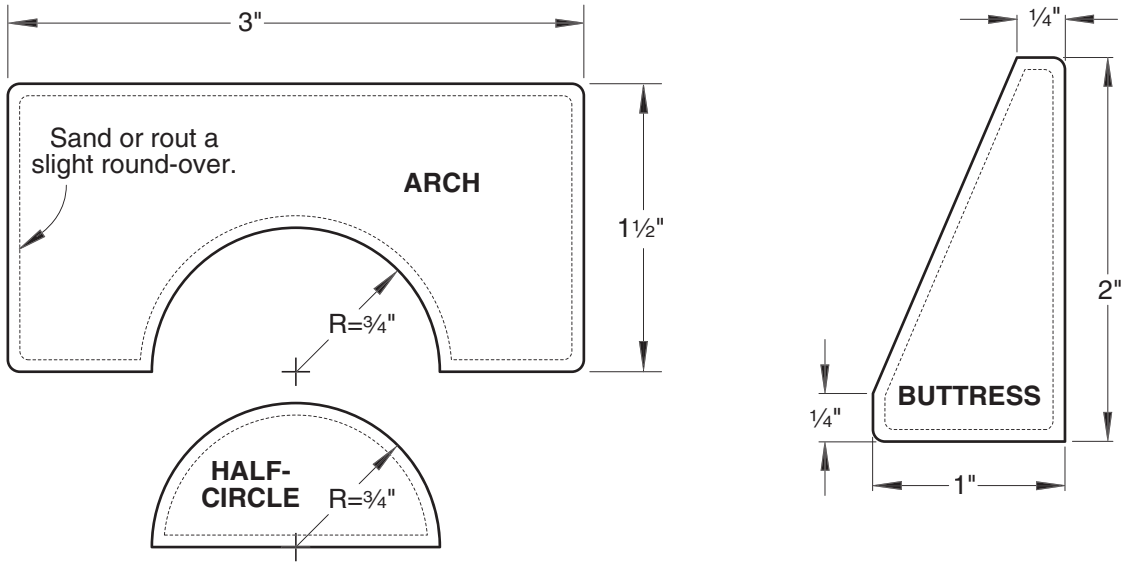
Dear Reader: As a service to you, we've included full-size patterns on this insert for irregular shaped and intricate project parts. You can machine all other project parts using the Materials List and the drawings accompanying the project you're building.

© Copyright Meredith Corporation, 2005. All rights reserved. Printed in the U.S.A. Meredith Corp., the publisher of *WOOD Patterns*® allows the purchaser of this pattern insert to photocopy these patterns solely for his/her own personal use. Any other reproduction of these patterns is strictly prohibited.

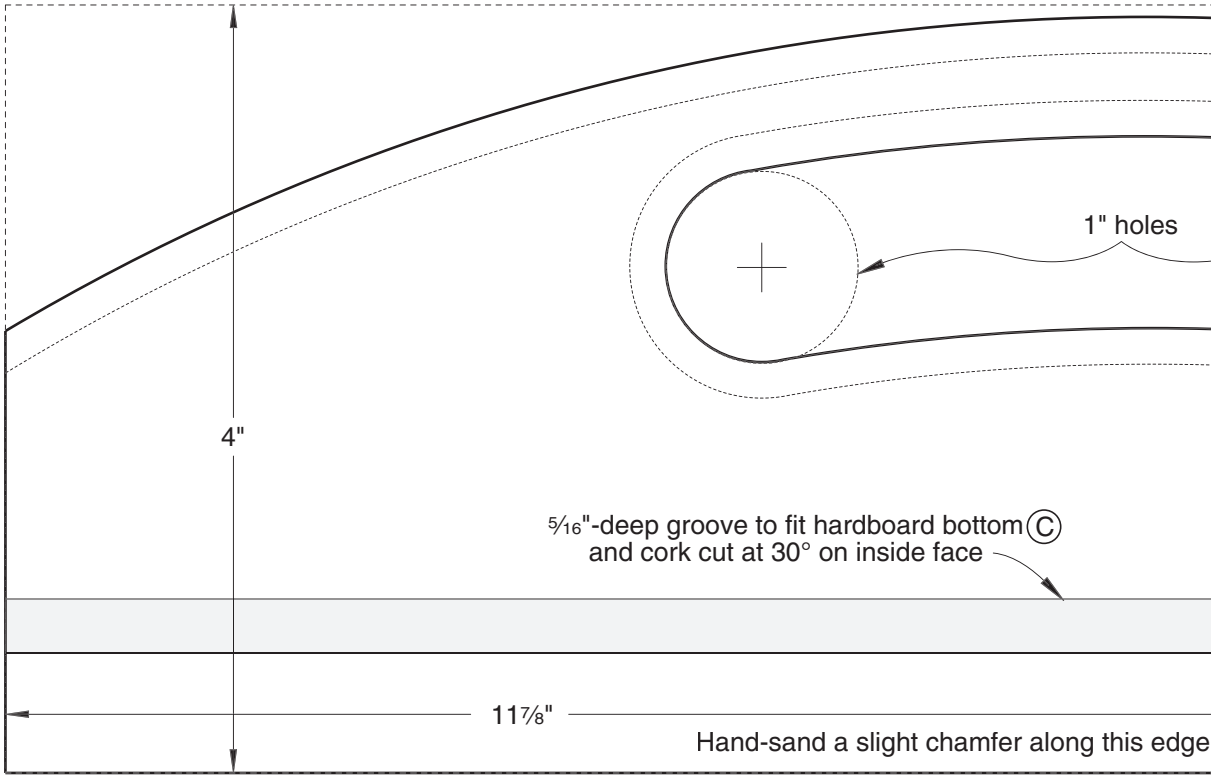
Scrap Blocks, Page 30
Salt and Pepper Mills, Page 41
Computer Desk, Page 46
Serving Tray, Page 88

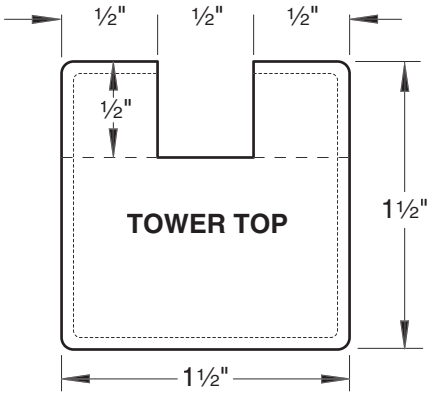


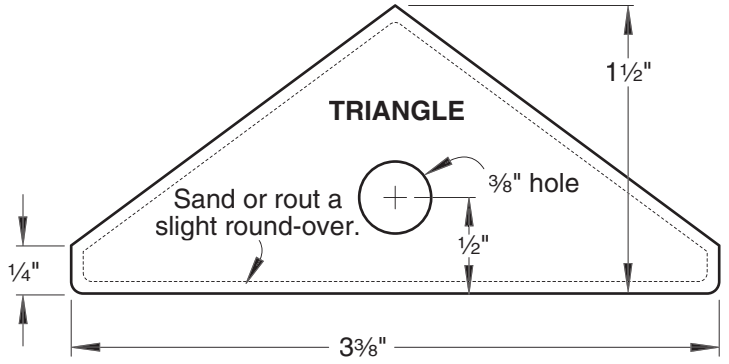
Scrap Blocks, Page 30

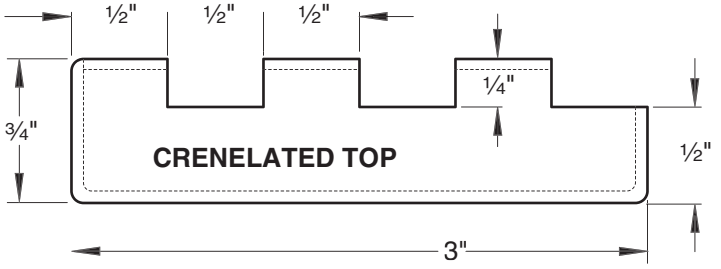


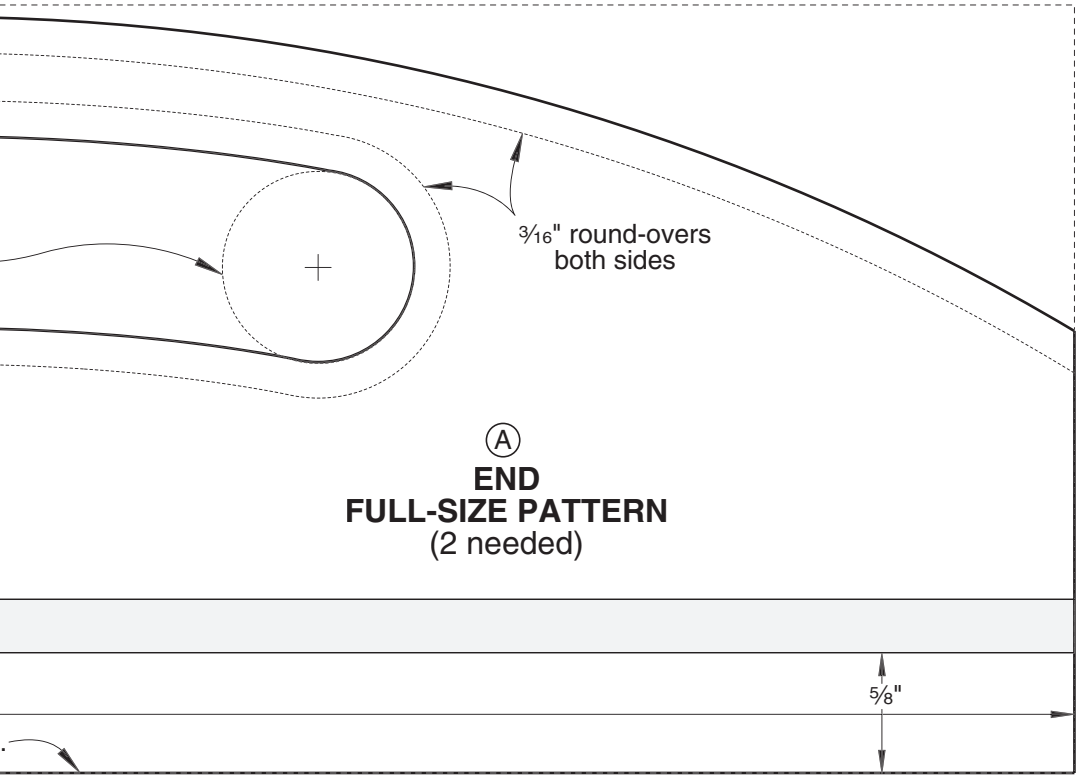
Serving Tray, Page 88


1" holes
4"
5/16"-deep groove to fit hardboard bottom Ⓒ and cork cut at 30° on inside face
11 7/8"
Hand-sand a slight chamfer along this edge



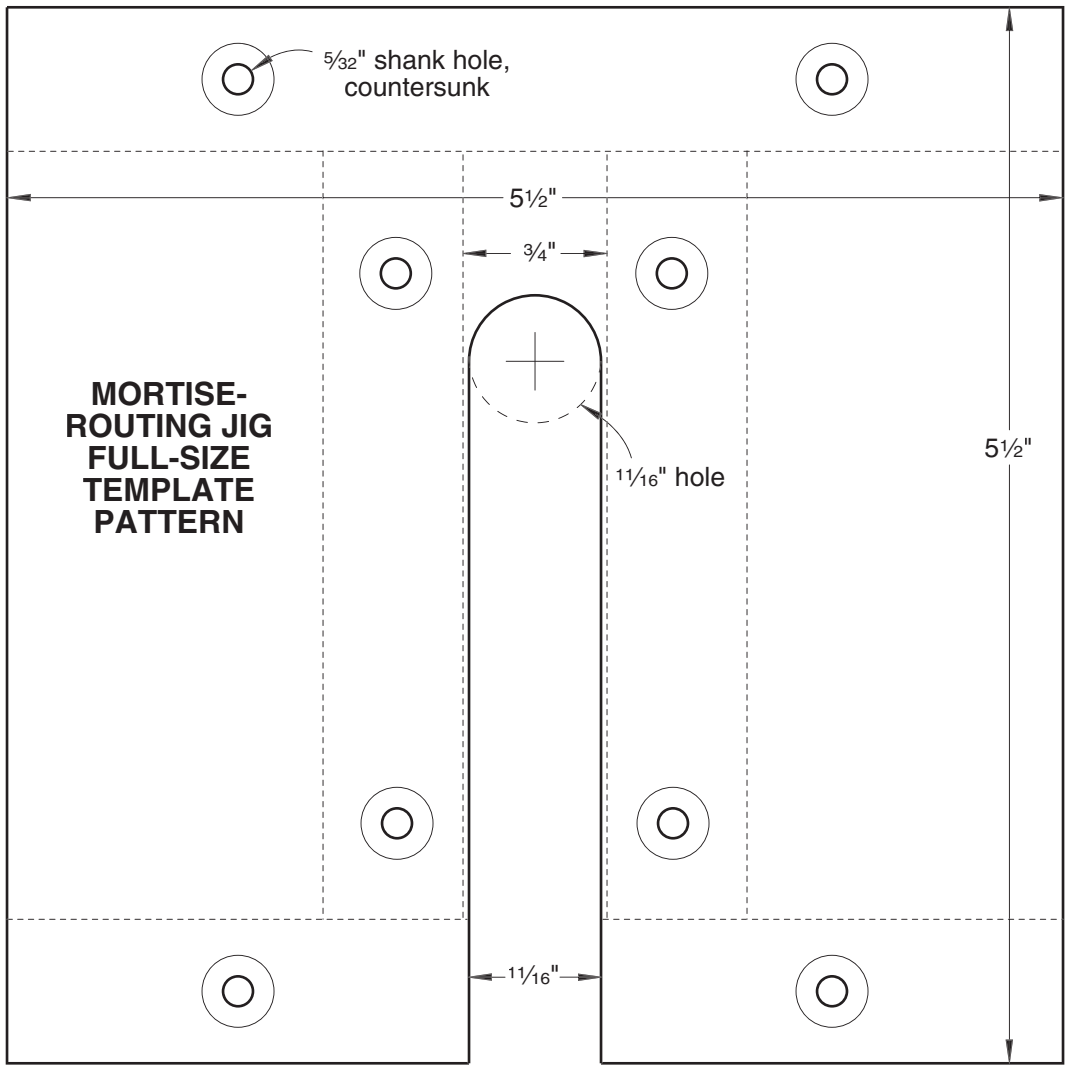




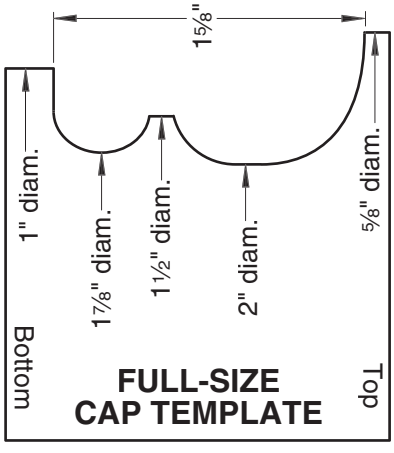


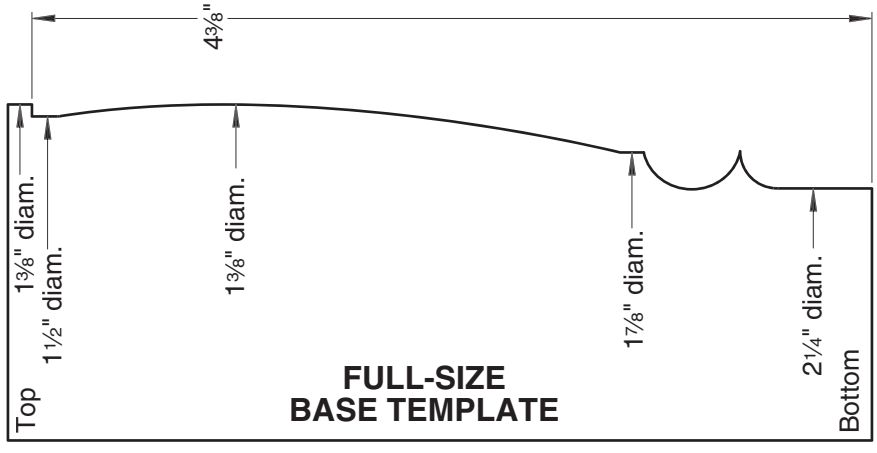
Ⓐ
END
FULL-SIZE PATTERN
(2 needed)

Computer Desk, Page 46



Salt and Pepper Mills, Page 41





2 safe & simple ways to make raised panels

with your tablesaw ... or table-mounted router

Raised panels have long been viewed as signs of fine craftsmanship—perhaps because they appear difficult to make. But as you'll see here, that need not be the case. We'll show you two dependable methods for cutting raised panels, one using the tablesaw; the other, a table-mounted router. Better still, you'll find that both methods excel at safety and accuracy.

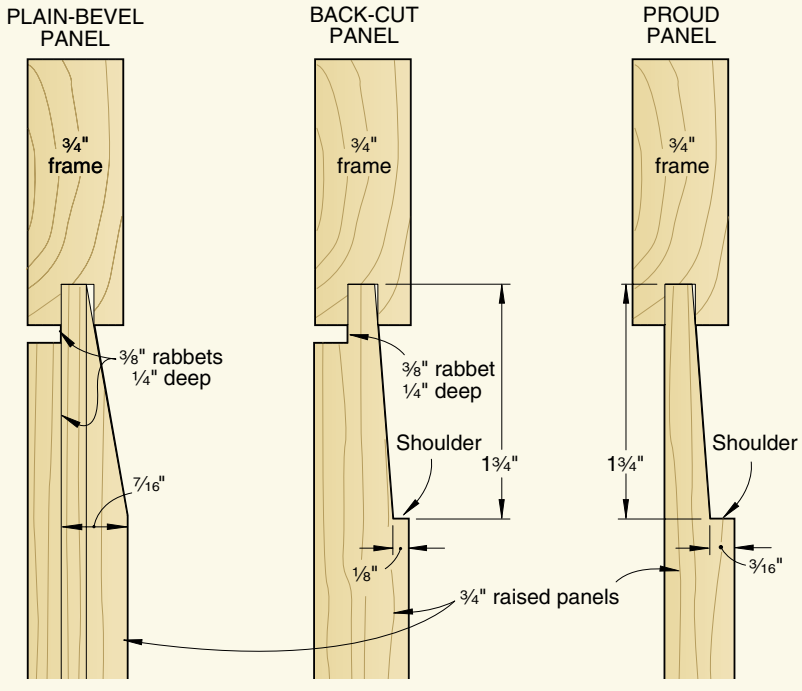
Preparing the panels

Before cutting the door panels to size, match the wood tones and arrange the grain patterns for best appearance. For example, center the cathedral (inverse V) pattern on narrow, single-board panels. When gluing up wider panels, use pieces cut from the same board for consistent grain and color.

Next, decide which style of panel you want, such as a plain-bevel panel like those in the desk on *page* 46; one that's flush with the frame, called a back-cut panel (see the drawing at *right*); or a proud panel (with the panel raised above the frame). All will give your panels a custom look. Glue up the stock needed to make your panel blanks. Then, cut your panels to finished size.

Note: *To minimize wood movement, we suggest using boards no wider than 5" when gluing up your panels.*

3 POPULAR PANEL STYLES TO CHOOSE FROM



Pros • contemporary look
• easy-to-sand bevels
Cons • no panel detail to catch the eye

Pros • shoulder detail catches the eye
Cons • bevels are a bit more difficult to sand

Pros • can decorate shoulder with profile router bits
Cons • bevels are a bit more difficult to sand

Method 1: Cut raised panels with a tablesaw

For the woodworker who doesn't have a router table or the budget for expensive raised-panel bits, cutting raised panels on the tablesaw is an effective alternative. This method does have one drawback: You'll need to invest time and elbow grease into finish-sanding the panel bevels.

To solve the challenge of supporting panels safely while cutting bevels, make the easy-to-build panel-cutting sled shown *below*.

Mark the bevels

Looking at the end of the panel blank, lay out the desired bevel using a sliding bevel square. Also, if your panel needs a tongue and rabbet lay them out, at this time.

Build the basic sled

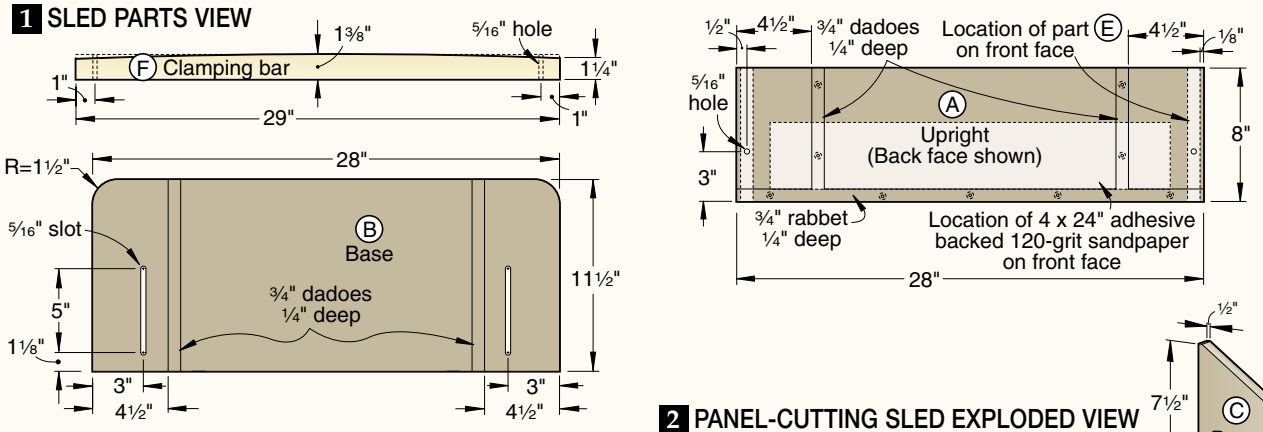
Combine scrap material with a few hardware items and you'll have a jig destined for a lifetime of service. Follow these simple steps:

1 Cut two pieces of ¾" MDF to the dimensions in the **Materials List** to make the upright (A) and base (B). Scrollsaw or bandsaw the 1½" radii on two corners of (B), cutting outside the line, and then sanding to it.
2 Using a dado blade, cut two ¾" dadoes ¼" deep in the top of the base, where shown **Drawing 1.**
3 After adding a sacrificial auxiliary fence to your saw fence, cut a rabbet ¾" wide and ¼" deep along the bottom edge of the upright (A) where shown.
4 Next, drill 5⁄16" holes in the upright (A) and at the ends of the slot locations in the base. Lay out the sides of the slots, and scrollsaw them to shape with a #12 blade.
5 Cut two braces (C), as dimensioned in **Drawing 2.**
6 Drill 5⁄32" pilot holes, and then glue and screw the sled together using #8 x 1½" brass screws, where shown. Tip: *Use brass screws anytime your jig's screw holes are close to the saw blade.*

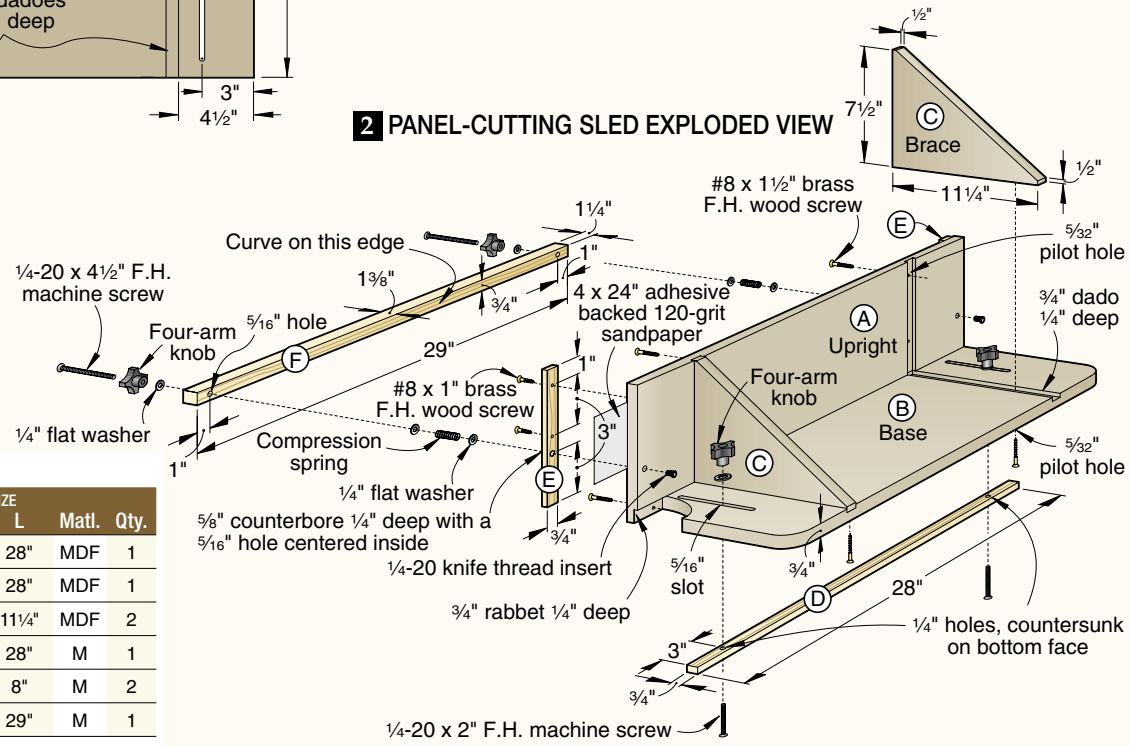
Now add the extras

1 Cut the guide strip (D) to fit your miter-gauge slot in depth and width. Trim the piece to 28" long, and drill countersunk ¼" holes centered on the strip 3" from each end. Now, attach the guide strip to the base using the hardware shown.
2 Cut the upright stops (E) to size, and drill the hole and counterbore hole, where shown in **Drawing 2.** Secure the stops to the ends of upright (A).
3 Cut the clamping bar (F) to size and drill 5⁄16" holes, where shown. Lay out and shape the clamping bar curve, as shown in **Drawing 1**, using a bandsaw. Sand smooth.
4 Next, attach the clamping bar to the sled using the hardware shown. Tip: *If you have trouble finding extra-long machine screws, cut two pieces of all-thread. Then secure the four-arm knobs to the screws using 5-minute epoxy.*
5 Remove the hardware and the clamping bar and guide strip, and sand all parts to 150-grit. Now apply two coats of finish, sanding between coats with 180-grit abrasive.
6 Cut a piece of adhesive-backed 120-grit sandpaper, and apply it to the sled face, as shown in **Drawing 1**.
7 Reassemble the sled.

1 SLED PARTS VIEW



2 PANEL-CUTTING SLED EXPLODED VIEW

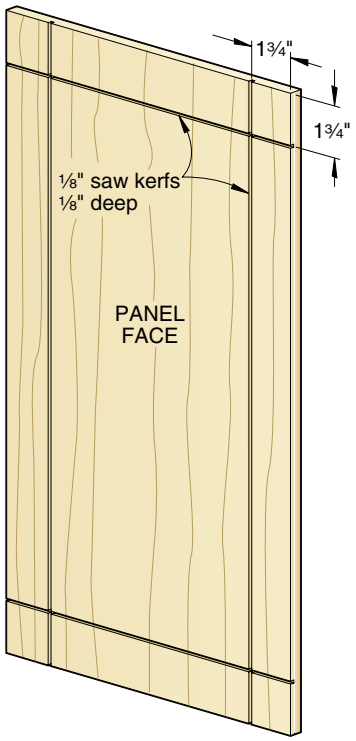


Materials key: MDF–medium-density fiberboard, M–maple.
Supplies: #8x1½", #8x1" brass flathead wood screws; ¼-20x2" (2), ¼-20x4½" (2) flathead machine screws; ¼-20 four-arm knobs (4); ¼" flat washers (8); 1½x⅜" compression springs (2); ¼-20 knife thread insert (2); 4" adhesive backed 120-grit sandpaper.
Blades and bits: Stack dado cutter.

Materials List

Sled assemblies		FINISHED SIZE T	W	L	Matl.	Qty.
A	upright	¾"	8"	28"	MDF	1
B	base	¾"	11½"	28"	MDF	1
C	braces	¾"	7½"	11¼"	MDF	2
D	guide strip	⅜"	¾"	28"	M	1
E	upright stop	⅜"	¾"	8"	M	2
F	clamping bar	¾"	1⅜"	29"	M	1

3 PANEL KERFS DEFINE SHOULDERS



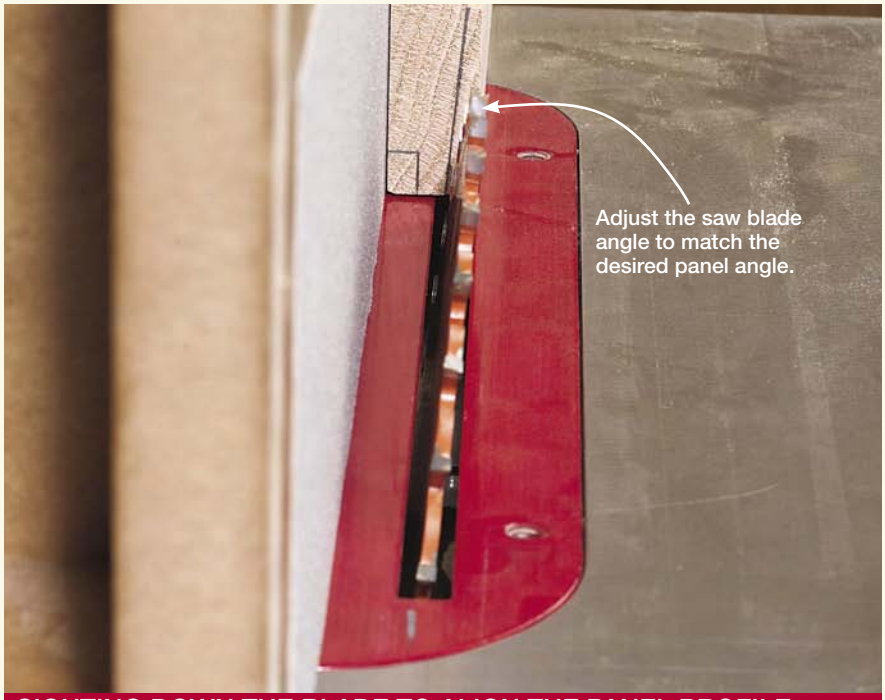
To cut a raised panel *with shoulders* (the square lip on the face of the panel), first adjust the tablesaw's fence 1¾" from the blade. Cut a saw kerf ⅛" deep (3⁄16" deep if making proud panels) and 1¾" from all four edges and ends of the panel's face as shown in **Drawing 3.** This kerf will determine the shoulder location.

Set up the sled for smooth, accurate cuts

For your sled to function well, it must slide parallel to the saw blade with its upright at a right angle to the saw's tabletop. With either out of alignment, scoring and burning will occur. The following set-up procedure assumes that your miter-gauge slot aligns parallel with your saw blade. If not, make that adjustment.

Adjust the blade to match your bevel

Place the panel into the sled with the exterior face out. To adjust the angle and height of the saw blade, sight down the blade, and align it with the layout marks, as shown *below.* Clamp a test piece into the sled and run it through. Readjust the settings until the angle and bevel thickness are dead-on accurate.



SIGHTING DOWN THE BLADE TO ALIGN THE PANEL PROFILE

Then, with a steel rule, measure the distance from the saw blade to the sled's upright. Move the sled side to side as needed so the distance between the blade and the sled is the same as the panel's tongue (and rabbet) thickness. When the upright is the correct distance from the blade, and parallel to the blade, tighten down the knobs in the guide strip. Now, adjust the blade bevel. See "Adjust the blade to match your bevel," *above.*

Let's cut a raised panel

Clamp your panel into the sled, exterior face out, and cut the bevels. Panels can be cut in four passes through the saw. First, cut across the end grain to reduce chip-out. Then cut the bevels on the panel edges. Move through the blade at a consistent speed, slowing down only if the saw strains.

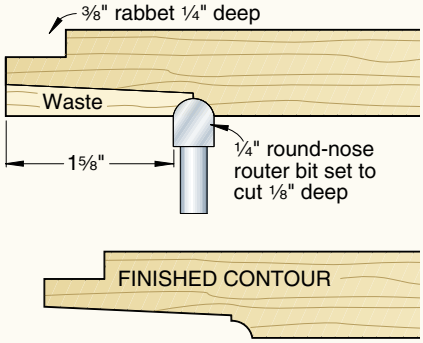
Note: *If your saw bogs down in the cut, you may need to use a thin-kerf blade or make the cut in successively deeper passes.*

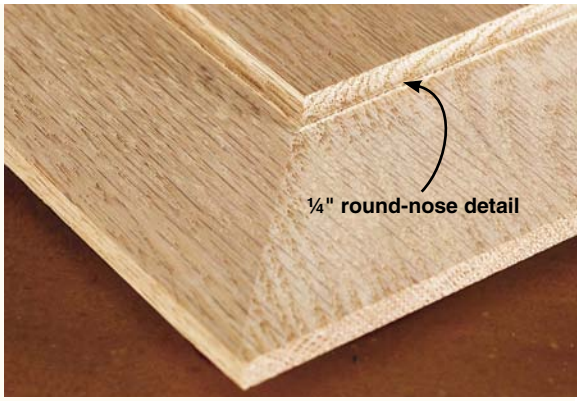
Sand the panel bevels

Remove any saw marks with 100-grit sandpaper and a hardwood block. Finish-sand the bevels with 150 and 220-grit sandpaper. Take care when sanding not to remove the ridge at the intersection of the bevels. Stain the panels before you assemble the door.

Add detail to your raised panels

After raising the panel on your tablesaw, use a ¼" round-nose bit in your router table to detail the square shoulder on the face of the panel. Set the bit 1⅝" from the fence, as shown at *right.* Then rout the detail, starting with the end grain first, followed by the edge grain.





A ¼" round-nose bit creates a distinct panel.

Method 2: Create impressive raised panels with a table-mounted router

Before we begin, there are a few key advantages you should know about raising panels on a table-mounted router. First, don't feel limited to just the straight bevel of the tablesaw method. Router bit manufacturers have many different profiles to choose from. See some at *right*. Router bits also leave few, if any, mill marks. That means less sanding. Another plus: A panel raised on a table-mounted router has flat tongues that allow the panel to float more freely in the frame. One drawback: Bits can set you back $50–$130.

Also, be aware that you should never cut panels raised on a table-mounted router in one pass. You won't get a quality cut, and you'll strain your router.

Managing the depth of cut can be accomplished in two ways. One requires you to change the height of the bit no more than ⅛" each pass. This method takes extra time measuring and readjusting the bit. A better way relies on spacers to change the depth of cut on each pass. When using this quick and easy method, the bit needs to be set only once. That fact alone eliminates the possibility of error and is the method we chose here.

How to use spacers

You can make spacers from just about any sheet material in the shop. Hardboard, plywood, MDF, even plastic laminate (for thin spacers) work well. We made four spacers from ⅛" Baltic birch plywood totaling ½" in height. (Most panel-raising bits remove ½"-⅝" material to achieve the final profile.)

COMMON ROUTER BIT PROFILES TO CHOOSE FROM

To size the spacers to your situation, cut the pieces the same length as your router table. Then measure the distance from the front of the router table to the middle of the opening in the router plate and rip them to that measurement.

Next, cut out a half-circle relief area for the raised-panel bit. To do this, measure the diameter of the bit and add ½" to allow for safe clearance. Using a compass, draw the half-circle centered on the inside edge of each spacer. Bandsaw or scrollsaw out the half circles. Sand the sawn edges smooth.

Set up to rout raised panels

Raising panels with router bits requires a variable-speed router capable of slowing a large-diameter bit (we used a 3⅜"-diameter bit) to about 10,000 rpm.

Now, set the height of the raised-panel bit by matching an existing panel, the profile on *page 60,* or another profile you prefer. Using scrap the same thickness as the panel, rout samples until you reach the correct profile.

Next, position the fence in line with the guide bearing on the bit. Adhere double-faced tape to the router table-top and lay the first spacer down, flushing the outside edges of the spacer with the front and sides of the router- table top. Repeat this step until you've secured all spacers in place. Make sure the bit is clear of any obstructions. See the photo *below left.*

Rout away!

Rout across the end grain first and then along the panel edges. (Doing this reduces chip-out.) If you have several panels to raise, cut them all before removing the spacer. After cutting all the panels the first time, lift off the top spacer, which exposes more of the bit's cutting edge. Again, start with the end grain and make the second pass, this time removing another ⅛" of material. Continue this process until you remove the last spacer. See photo *below.* Now sand as necessary through 220-grit, and apply finish to the raised panels.

SPACERS GIVE YOU A BETTER WAY TO ADJUST CUTTING DEPTH

Stack the ⅛" thick spacers on the router table top and secure them with double-faced tape.

Remove a spacer after making each cut until you've removed all of them for the final cut.

get-it-*all*-together sandpaper cabinet

Keep your discs, sheets, belts, and more handy, organized, and stored properly in this easy-to-build unit.

Interlocking cleats make hanging, and repositioning, the cabinet a snap.

AT A GLANCE

- Overall dimensions: 28" wide × 7¾" deep × 21" high.
- For the board feet of lumber and other items needed to build this project, see *page 67*.

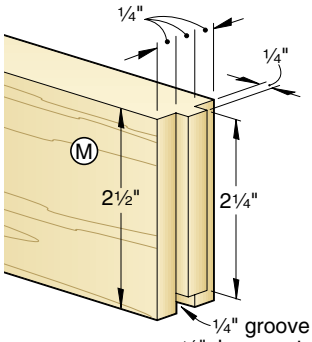
Tired of rummaging through drawers or hunting in several places for abrasives and related accessories? You'll instantly find what you need in this space-saving cabinet. Based on a design idea from reader Henry Parslow of Poughkeepsie, New York, the unit has pockets on the insides of the doors to hold full-size sandpaper sheets; horizontal compartments for orderly storage of half sheets, quarter sheets, and discs; and a bottom shelf for stowing such items as sanding drums, belts, and blocks. Floating dowels captured in angled slots in the case sides keep items in the divider assembly flat and orderly. Better yet, you can build it in a weekend and find *all* of the needed items at your local home center.

Let's start with the simple case

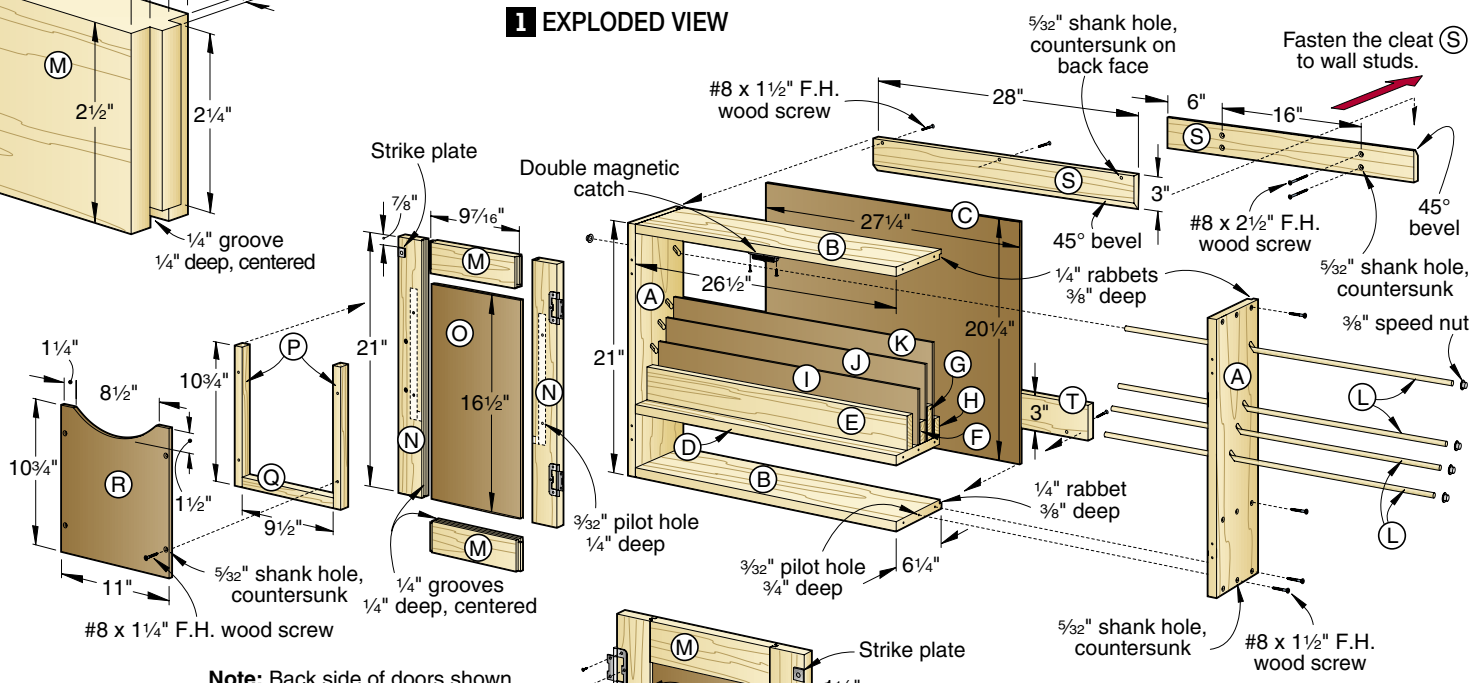
1 From ¾"-thick stock (we used pine), cut the sides (A) and top/bottom (B) to the sizes listed in the **Materials List**. Using a dado blade in your tablesaw, cut a ¼" rabbet ⅜" deep along the back edge of each part on the *inside* face, where shown on **Drawing 1**, to receive the back (C).

2 To form four angled ⅜" slots 1¼" long in the sides (A) to receive the sandpaper retaining dowels (L), where shown on **Drawing 1**, mark centerpoints on the *outside* face of one side piece for drilling ⅜" holes

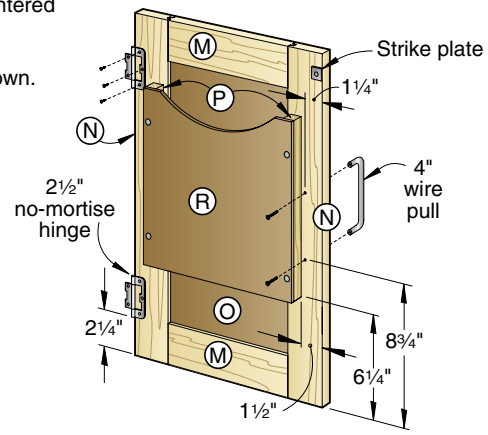
1a DOOR TENON DETAIL



1 EXPLODED VIEW



Note: Back side of doors shown.



COMPLETE THE ANGLED SLOTS

With the sides (A) double-face-taped together, cut along the inside of the marked lines to complete the ⅜" slots.

at the ends of the slots, where dimensioned on **Drawing 2**. Next, using cloth-backed double-faced tape, adhere the sides with the *inside* faces together and the rabbeted edges facing each other. Drill holes through both side pieces at the centerpoints using a backer to prevent tear-out. Then draw lines to complete the slot outlines. Now, using a jigsaw with a fine-tooth blade or a scrollsaw with a #2 reverse-tooth blade, cut out the slots, as shown in **Photo A**.

3 Separate the sides, and remove the tape. On the *outside* face of each side, mark centerpoints for nine mounting holes, where dimensioned on **Drawing 2**. Then drill the countersunk holes.

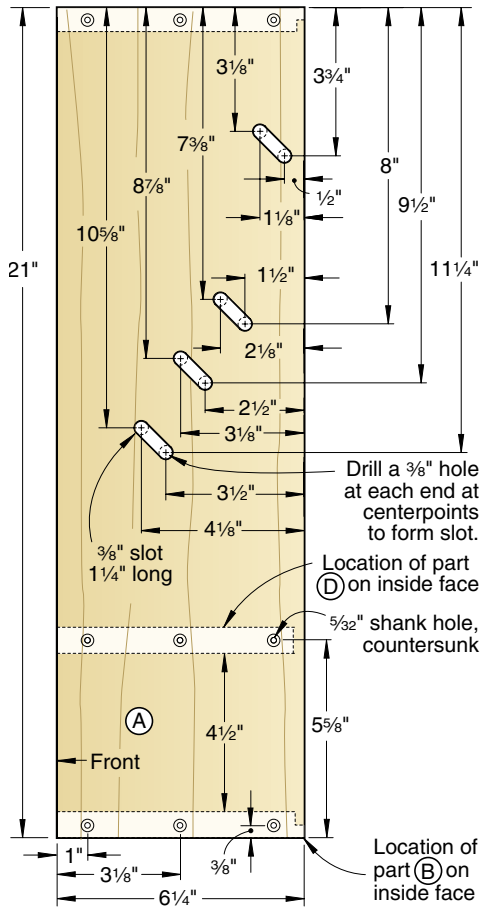
4 From ¼" hardboard, cut the back (C) to 20¼×27¼". Then glue and clamp the sides (A), top/bottom (B), and back together, checking for square. Using the countersunk holes in the sides as guides, drill pilot holes into the top/bottom, and drive the screws.

Next up: the shelf and divider assembly

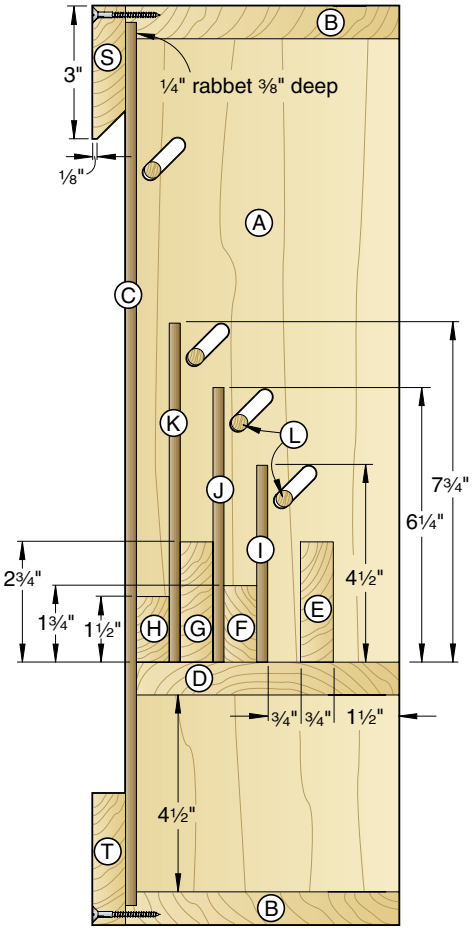
1 From ¾"-thick stock, cut the shelf (D), front rail (E), and divider spacers (F, G, H) to the sizes listed. Then, from ¼" hardboard, cut the dividers (I, J, K) to size. To keep them straight, identify the spacers and dividers by the part letters.

2 To form the divider assembly, glue and clamp together the divider spacers (F, G, H) and dividers (I, J, K) in the arrangement shown on **Drawing 3** and in **Photo B** on the *next page* with the bottom edges flush. Then glue and clamp the assembly to the shelf (D) with the back face of the divider spacer (H) flush with the back edge of the shelf.

2 RIGHT SIDE (Outside face shown)



3 SIDE SECTION VIEW



3 Apply glue to the bottom edge of the front rail (E). Then clamp the rail to the shelf (D) 1½" from the front edge, where dimensioned on **Drawing 3**. (To easily position the rail, we spaced out three 3"-tall spacers from ¾"-thick scrap on end between the rail and hardboard divider I.)

4 To position the shelf/divider assembly (D through K) in the case, where dimensioned on **Drawing 3**, cut two 4½×7" spacers from ¼" hardboard. Then install and fasten the assembly, as shown in **Photo C**. Remove the spacers.

5 From ⅜" birch dowels 36" long, cut four 28⅝"-long pieces for the sandpaper retaining dowels (L). With the case on a side (A), position the dowels in the angled slots in the sides, where shown on **Drawing 1**. To secure the dowels, drive ⅜" speed nuts on the ends, as shown in **Photo D**. (If a speed nut does not stay in place because of an undersized dowel, apply a dab of five-minute epoxy to the dowel end to retain the nut.) Holding the dowels in place, turn the case onto the other side, and again drive speed nuts on the dowels.

Build the doors, and add the pockets

1 From ¾"-thick stock, cut the door rails (M) and stiles (N) to the sizes listed. Save the cutoffs for making test tenons. Then, from ¼" hardboard, cut the door panels (O) to size.

2 Using a dado blade in your tablesaw, cut a ¼" groove ¼" deep centered along the *inside* edges of the rails (M) and stiles (N), where shown on **Drawing 1**.

3 To form tenons on the rails, where shown on **Drawings 1** and **1a**, attach an auxiliary fence to your rip fence and an auxiliary extension to your miter gauge. Position the auxiliary fence so it just touches the outside of your ¼" dado blade. Then form a ¼" tenon ¼" long on the end of a rail cutoff. Test-fit the tenon in the groove of a stile. Adjust your setup, if needed, and then cut the tenons on the rails.

4 Glue and clamp the rails (M) and stiles (N) together with the panels (O) captured in the grooves. Check the doors for square.

5 To add pockets on the *inside* of the doors for storage of full-size sanding sheets, cut the vertical spacers (P) and horizontal spacers (Q) to the sizes listed from ¾"-thick stock. Then, from ¼" hardboard, cut the pocket panels (R) to size.

6 Mark the center and ends of the curves on the top of the pocket panels, where dimensioned on **Drawing 1**. Bending a fairing stick to the marked points, draw the curves. Then bandsaw or jigsaw and sand the panels to shape. (For a free fairing stick plan, go to woodmagazine.com/fairing.)

7 Glue and clamp the vertical and horizontal spacers (P, Q) to the back of the panels (R), where shown, keeping the edges and ends flush. After the glue dries, glue and clamp the pocket assemblies (P/Q/R) to the inside of the doors, where dimensioned on **Drawing 1**. Drill countersunk mounting holes through the assemblies into the door stiles (N), and drive the screws.

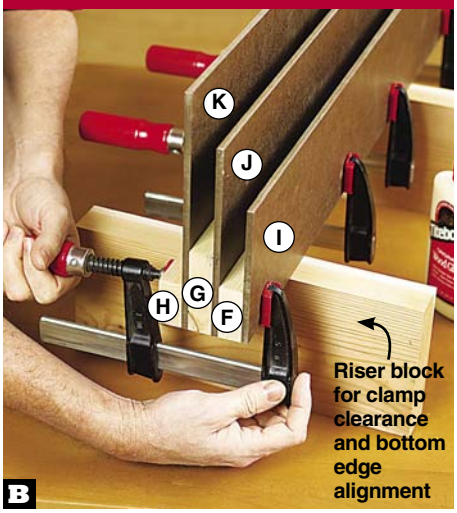
8 Mark centerpoints for 4" wire pulls on the inside faces of the doors, where dimensioned on **Drawing 1**. Drill the holes, and attach the pulls with the supplied screws.

Mount the doors and a magnetic catch

1 Position 2½" no-mortise hinges on the *inside* faces of the *outer* door stiles (N), where dimensioned on **Drawing 1**. Drill pilot holes, and mount the hinges using the screws supplied with the hinges.

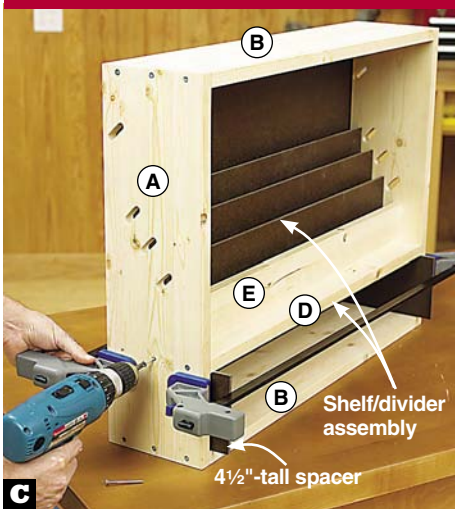
2 To mount the doors to the case, apply cloth-backed double-faced tape to the back (case side) of the small hinge leaves. (We applied two layers of tape for best adhe-

GLUE/CLAMP THE DIVIDER



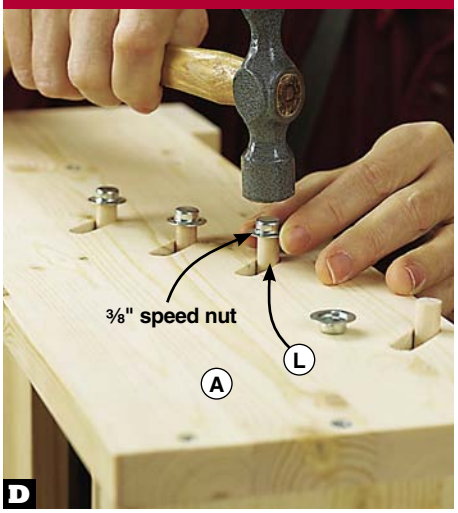
Keeping the bottom edges and ends flush, glue and clamp the spacers (F, G, H) and dividers (I, J, K) together in the order shown.

ATTACH THE SHELF/DIVIDER



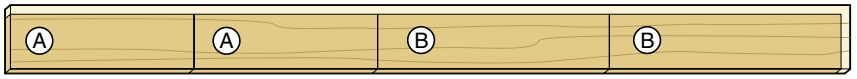
With the shelf/divider assembly (D through K) on 4½"-tall spacers and clamped between the case sides, drive the screws into shelf (D).

INSTALL THE SPEED NUTS

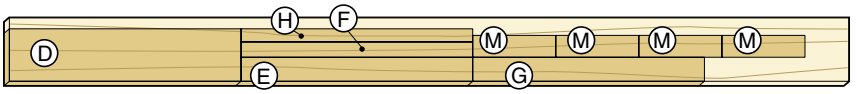


Using a small hammer, tap the ⅜" speed nuts squarely onto the ends of the sandpaper retaining dowels (L).

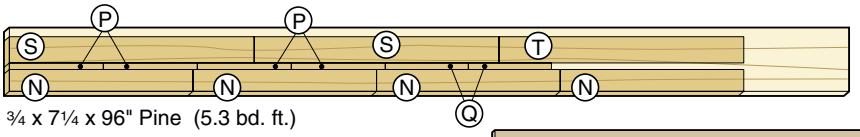
Cutting Diagram



¾ x 7¼ x 96" Pine (5.3 bd. ft.)

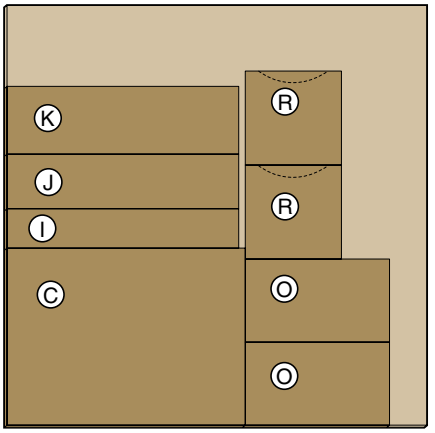


¾ x 7¼ x 96" Pine (5.3 bd. ft.)



¾ x 7¼ x 96" Pine (5.3 bd. ft.)

⅜"-diam. Birch dowel 36" long (4 needed)



¼ x 48 x 48" Hardboard

sion.) With the case on a flat surface, bottom (B) down, position the doors on the case with the outer stiles (N) flush with the outside face of the case sides (A). Press the doors firmly against the case to adhere the tape. Then carefully open the doors, and mark the hinge mounting holes. Remove the doors and tape. Now drill the holes, reposition the doors, and screw the hinges to the case.

3 Mount a double magnetic catch on the bottom face of the top (B), centered and flush with the front edge, where shown on **Drawing 1**, using the supplied screws. Then mount the mating strike plates on the doors, where dimensioned.

Time to finish, hang, and stock the cabinet

1 To hang the storage cabinet, cut the two cleats (S) and spacer (T) to size. Bevel-rip one edge of each cleat at 45°, leaving a ⅛" flat along the edge, where shown on **Drawings 1** and **3**. Position a cleat and the spacer on the back of the cabinet, where shown, with the edges and ends flush. Drill countersunk mounting holes through the cleat and spacer into the case top and bottom (B), and drive the screws. Then, holding the remaining cleat on your wall with the beveled edge positioned as shown, drill countersunk mounting holes through the cleat into the studs, where dimensioned, and drive the screws.

2 Sand all parts of the cabinet, except for the hardboard, to 220 grit, and remove the dust. Apply two coats of a clear finish. (We brushed on Varathane Diamond Wood Finish, semigloss, sanding to 220 grit between coats.) Finally, hang the cabinet. Then round up your sanding supplies, and load 'er up.

Written by **Owen Duvall** with **Erv Roberts**
Project design: **Henry Parslow** with **Kevin Boyle**
Illustrations: **Roxanne LeMoine**

Materials List

Case		FINISHED SIZE T	W	L	Matl.	Qty.
A	sides	¾"	6¼"	21"	P	2
B	top/bottom	¾"	6¼"	26½"	P	2
C	back	¼"	20¼"	27¼"	H	1
Shelf and divider assembly						
D	shelf	¾"	6"	26½"	P	1
E	front rail	¾"	2¾"	26½"	P	1
F	divider spacer	¾"	1¾"	26½"	P	1
G	divider spacer	¾"	2¾"	26½"	P	1
H	divider spacer	¾"	1½"	26½"	P	1
I	divider	¼"	4½"	26½"	H	1
J	divider	¼"	6¼"	26½"	H	1
K	divider	¼"	7¾"	26½"	H	1
L	sandpaper retaining dowels	⅜" diam.		28⅝"	B	4
Doors						
M	rails	¾"	2½"	9⁷⁄₁₆"	P	4
N	stiles	¾"	2½"	21"	P	4
O	panels	¼"	9⁷⁄₁₆"	16½"	H	2
P	vertical spacers	¾"	¾"	10¾"	P	4
Q	horizontal spacers	¾"	¾"	9½"	P	2
R	pocket panels	¼"	10¾"	11"	H	2
Mounting cleats and spacer						
S	cleats	¾"	3"	28"	P	2
T	spacer	¾"	3"	28"	P	1

Materials key: P–pine, H–hardboard, B–birch.
Supplies: Cloth-backed double-faced tape; #8x1¼", #8x1½", and #8x2½" flathead wood screws; ⅜" speed nuts (8); five-minute epoxy; 4" wire pulls (2); 2½" no-mortise hinges (2 pr.); double magnetic catch with strike plates (1).
Blades and bits: Dado-blade set, fine-tooth jigsaw blade or #2 reverse-tooth scrollsaw blade.

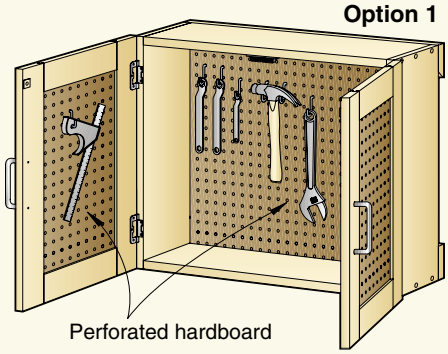
2 options for storing other items in the cabinet

Need a cabinet to stow hand tools, portable power tools, or other miscellaneous supplies? Just make a few simple changes to the sandpaper cabinet.

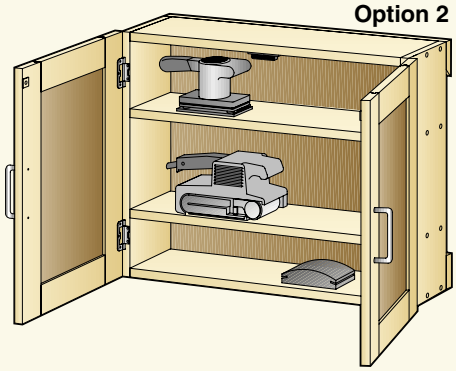
Option 1: For hand-tool storage, leave off the shelf (D), front rail (E), divider assembly (F through K), and door pocket assemblies (P/Q/R). When assembling the case and doors, use perforated hardboard for the back (C) and door panels (O). Add hooks, and hang your tools, using both sides of the doors for maximum storage.

Option 2: For power tools and miscellaneous supplies, leave off the front rail (E), divider assembly (F through K), and door pocket assemblies (P/Q/R). Install additional shelves, spacing them as needed to accommodate your tools and supplies.

Option 1



Option 2



mount cabinet doors for a *perfect* fit

When your cabinet doors bind, you're in a bind. Avoid problems by mastering these methods for hanging doors right and tight.

You're near the cabinetmaker's moment of truth: You've fastened the last hinge in place and sent your door arcing closed. When it stops, you'll know whether you've achieved excellence or exasperation. Relax. Armed with the shop-tested information here, you can turn this moment of truth into one of triumph.

Plan around your door style

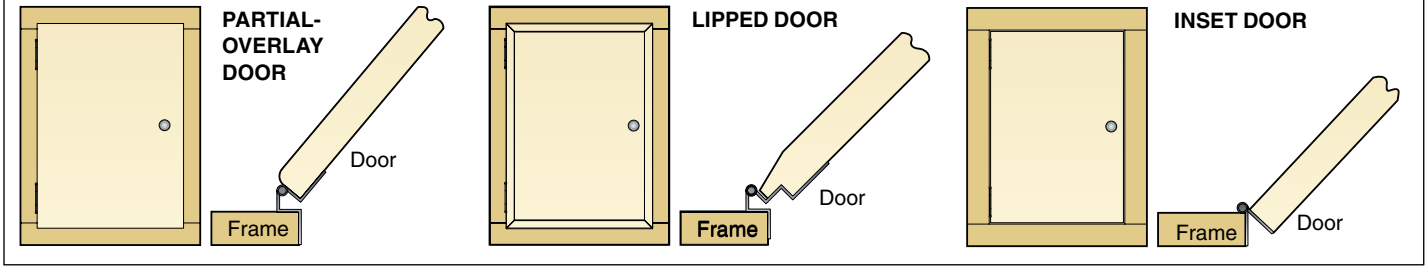
The type of door you choose determines the techniques and hardware you'll need for installation success. Most cabinets feature one of three types of doors:

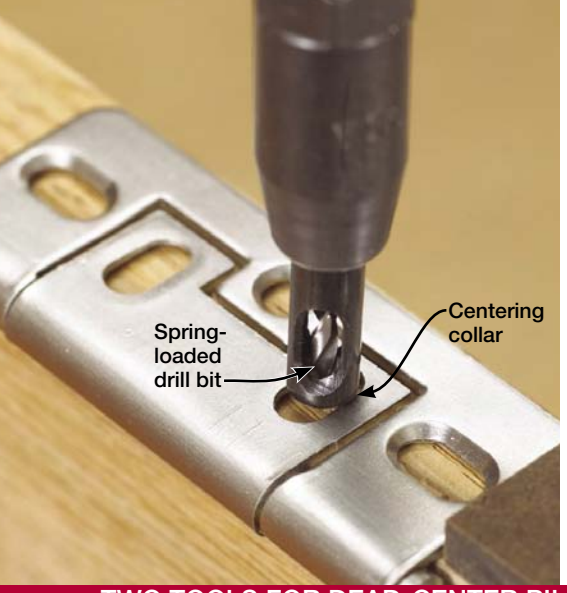
- **Full-overlay and partial-overlay doors.** Both mount in front of the cabinet frame and opening. Full-overlay doors cover all but a roughly ⅛" space around the frame. Partial-overlay doors, like the ones typically used on kitchen cabinets, leave a ½–1"-wide view of the frame around the edges of the door. Fitting these doors to your cabinet doesn't demand quite the level of precision you'll need for the other two styles, but hinges still need to be positioned so the door rests uniformly against the frame and facing doors line up with each other.
- **Lipped, or partial inset, doors.** These feature a rabbet around the back edge of the door that allows the panel to drop partway into the cabinet frame, eliminating a visible gap between door and cabinet. The lip conceals minor out-of-square problems, but you'll still need to leave a consistent ⅛" gap between the lip and the frame, to leave room for the offset hinges.
- **Inset doors.** The front face of an inset door rests flush with the face of the frame or cabinet, with a consistent 1/16–3/32" gap around all four sides. Inset doors like those used on most *WOOD*® magazine projects, including the computer desk shown on *page 46*, require exacting measurements and dead-on square glue-ups. But they also provide a sophisticated, clean look that's a testament to your craftsmanship.

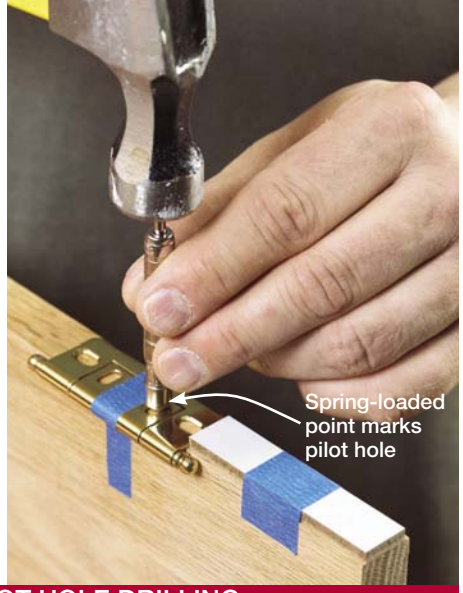
Success hinges on hinges

Once you zero in on a door type, you're ready to choose the appropriate hinges. You'll find a sampling of different types on *page 70*. Some hinges only work with a specific rabbet size or stock thickness. For example, the most common offset hinges for partial inset doors work with a ⅜" rabbet around the back face of the door. Other hinges, such as a partial-wrap hinge, fit common ¾" stock.

Major door styles and the hinges they use







TWO TOOLS FOR DEAD-CENTER PILOT-HOLE DRILLING

Drilling pilot holes in the exact center of a hinge hole or slot is essential for door-mounting accuracy. The spring-loaded Vix drill bit on the *left* not only finds the center of a slot, it drills a pilot hole to the depth you set. The more economical self-centering screw-hole punch on the *right* requires taping the hinge in place to free both hands for marking the pilot hole.

The style of your project also influences the type of hinge you'll choose. For example, you wouldn't put European-style hinges on a rustic country cabinet door or strap hinges on a frameless contemporary cabinet.

No set rules exist for scaling hinge size to door size. Most cabinet and furniture doors have stiles and rails 2–2½" wide, so we often opt for no-mortise leaf hinges with a 2" barrel. (See glossary of terms at *right*.)

The number of hinges to use varies with the size and weight of the door. A rule of thumb suggested by one hinge manufacturer calls for two hinges on doors up to 36" high or 15 pounds, three hinges for doors up to 65" high and 15–30 pounds, and four hinges for doors 85" high and 30–45 pounds.

Other characteristics that may influence your hinge choice include finish, its weather resistance, and adjustability. Many of the most commonly used hinges come in a choice of bright or antique brass, chrome or nickel, bronze, pewter, copper, and black finishes. For outdoor use, though, you'll want one with either a painted, zinc-coated, or chrome finish.

European-style concealed hinges have the edge on adjustability. Most models allow you to adjust the cabinet door up and down, from side to side, and in or out of the frame or cabinet opening. See our May 2004 issue (#155) for instructions on how to install and adjust European-style hinges.

Some traditional leaf-style choices also offer easy-adjustment installation. Instead of the usual three holes per leaf, no-mortise hinges use two vertical slots and one round screw hole on one leaf and two horizontal slots or a slot and hole on the other leaf. They get their "no-mortise" name because the two leaves fold together to form a single thickness, as shown *opposite*. This automatically leaves a 1/16" gap between the door stile and frame on an inset door, eliminating the need to chisel or rout a mortise to recess the hinge leaf flush with the surrounding wood.

For more information on installing an inset door using no-mortise hinges, see our six-step method on *page 71*.

Prepare for the job

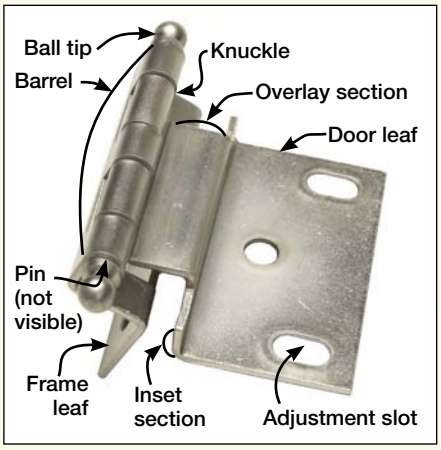
Regardless of the door type or hardware you choose, a few tools and preparations will simplify the installation job. Begin by working on a solid, dead-flat surface. An irregular worksurface can cause the cabinet carcase to rack, making doors hard to fit and mount.

Minor off-square mistakes can escalate into bigger problems. A door that's off-plumb by just 1/32" needs to be planed by that much along the two stile edges, ultimately adding 1/16" to the gap. That doesn't sound like much until you recall that inset doors should have a gap of only 1/16–3/32".

These shop-made accessories and specialty tools increase your chances for success:

- A precise try or combination square ensures square glue-ups. Use a precision steel rule and a fine-lead pencil or crafts knife for exact marking.
- Centering bits, also called Vix bits, automatically position your pilot holes at the center of the hinge hole. A less-expensive alternative is a self-centering screw-hole punch that indicates where to drill your pilot hole. Both are shown *above left*.
- A 1⅜" or 35mm Forstner bit to drill flat-bottom holes for European-style hinges.
- An assortment of spacers for consistently positioning your hinges on both the door and frame, as shown on *page 71*. These can be custom cut from ⅛"- or ¼"-thick scrap.

LEAF-STYLE HINGE PARTS AND GLOSSARY



More hinge terms

Concealed hinge. One where no parts show when the door is closed.

Degree of opening. The angle of swing a door will open from its closed position.

Exposed hinges. The barrel or leafs show when the door is closed.

Half-mortise hinge. One leaf is mortised into a door edge while the other mounts to the surface of the frame.

Half-surface hinge. One leaf is mortised into the frame while the other mounts on the surface of the door.

Reveal. The gap between the edge of a cabinet door and the edge of another door or the edge of the frame.

Self-closing hinge. A spring within the hinge pulls the door closed when slightly open and holds it closed.

Swag. A slight bend in the leaf of a hinge near the barrel to allow both leaves to rest flat against each other.

Zero-clearance hinge. A hinge that pulls a full-overlay door away from the cabinet opening for unobstructed access.

If you plan to install multiple doors, avoid confusion by marking which are right-hand or left-hand doors and which end you want at the top. In the case of flat-panel doors, also indicate the side that should face out. If you're making several cabinets, label which doors go in each individual cabinet.

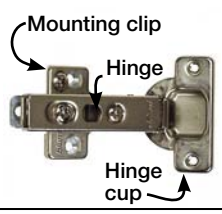
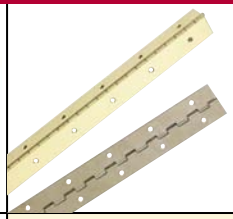
To avoid marring a finished door, temporarily mount your hinges after the doors and cabinet have been sanded to their final thickness, but not stained and finished (except for the center panel).

Fits and starts

Truth be told, your door-hanging efforts will be over before they begin if your doors don't fit the cabinet openings. Test for squareness using your try or combination square on each corner of the door and each corner of the cabinet opening.

Although it's possible to build doors oversize by 1/16–1/32" and cut them down to fit specific openings, that raises the risk of removing too much material during machining or while resanding the trimmed edges. So aim to get it right the first time by taking careful measurements and gluing up your doors with care.

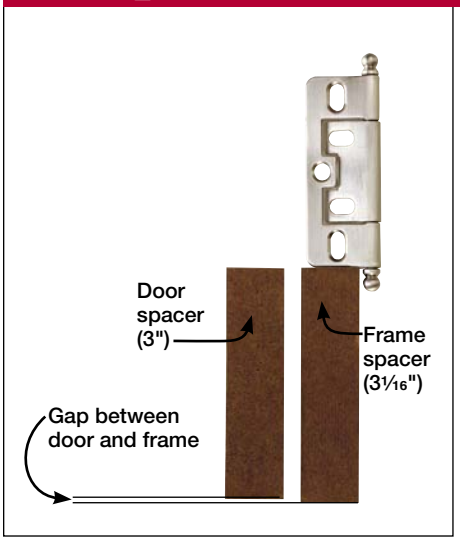
Common cabinet hinges and their applications

Hinge type						
	110° European edge-mount	**107° European full-overlay clip-on**	**Piano (continuous)**	**Butt**	**No-mortise (ball-tip)**	**Adjustable-mount (ball-tip)**
Uses	For overlay doors (up to ¾" overlay for this one) where concealed frame face mounting is preferred.	Use on full-overlay or half-overlay doors. The clip mounts inside a cabinet on the side surface.	Extra length supports large or heavy doors. Can be cut to the length of a door edge.	Traditional choice for cabinet doors.	Suitable for most inset cabinet doors, especially where minimal gap is wanted.	General-purpose hinge for all but the smallest projects.
Comments	Allows 110° door swing. Adjusts for raising, lowering, and plumbing door.	Other versions offer 120° and 170° openings. Mounting plates may be sold separately from hinges.	Most lack a swag and require a mortise to reduce gaps on inset doors. Specialty suppliers offer swagged styles.	Must be mortised for inset doors. Not adjustable.	Several finishes are available. Used on many *WOOD*® magazine projects because of its ease of installation.	Several finish options. Use without mortises for 3/32" gap or mortised on one or both leaves for smaller gaps.
Cost*	$3.80 each	$4.68 each	$4.40–$20.90 each (varies by length and leaf width)	$.74–$35.10/pair (varies with size and materials)	$.43–$5.80 each (some sold in pairs)	$3.55–$5.10 each

Hinge type						
	Offset (ball-tip)	**Partial-wrap inset (ball-tip)**	**Double-offset knife (or pivot)**	**Strap (5" zinc-plated)**	**⅜" inset overlay**	**Surface-mounted ornamental**
Uses	Use on partial inset doors with a ⅜" rabbet around the back outside edge.	A general-purpose hinge for inset doors. No-mortise design leaves minimal gap.	Mounts on top and bottom door edges to become inconspicuous when the door is closed.	A heavy-duty hinge suitable for outdoor use; typically surface-mounted.	By mounting on the frame face, this hinge allows the amount of door overlay to vary.	Use as decorative hinges on projects with small or lightweight doors.
Comments	Several finish options. Shape helps ensure uniform mounting position without mortising.	Full-wrap version mounts around the cabinet frame edge. Several decorative tip and finish options.	Variations work with overlay doors. Mortising is required for minimal gaps.	Sizes range from 3" to 24". Some types may have too much play for precision work.	May incorporate a spring to make the door self-closing. Several finishes available.	No built-in adjustability. May be less sturdy than other styles. Many design variations exist.
Cost*	$5.60–$6.10 each	$2.90–$3.20 each	$7.25–$10.60/pair	$.80–$15.00/each (varies by size and style)	$2.85–$3.50/pair	$.45–$8.50/pair (varies greatly with style, size)

* Prices from Lee Valley Tools are for comparison only. Your prices may vary by vendor, manufacturer, style, size, and quantity purchased.

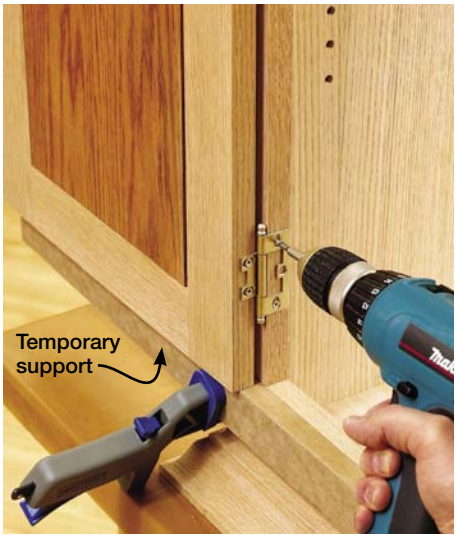
6 Steps to Installing an Inset Door



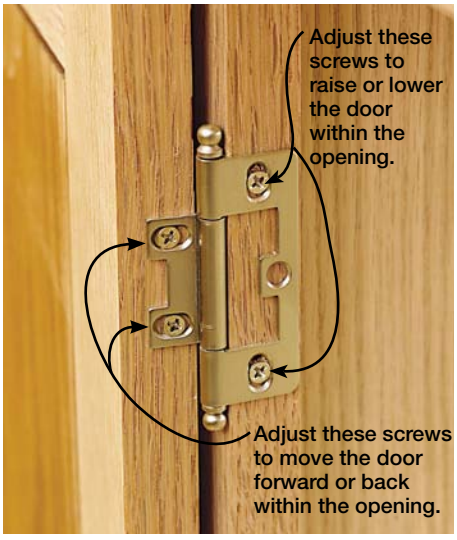
1 Tailor a pair of spacers to the dimensions of your hinges and where you want them mounted on the cabinet. For example, to position the hinges on our computer desk's overhead cabinet, we cut strips of hardboard scrap ¾" wide. From this, we cut a 3 1/16" spacer to use on the edge of the frame and a 3" spacer for the edge of the cabinet door. Combined, these two sizes leave a 1/16" gap between the door and the frame using this particular no-mortise hinge.

2 Tape a spacer to the frame edge, as shown *above*. Then clamp the hinge to the frame of the cabinet so that the barrel rests against the front edge of the frame. This leaves your hands free to drill the pilot holes using a spring-loaded centering bit, or to mark their position with a self-centering punch. Place the pilot holes at the centers of the two slots, but do not drill a hole beneath the round center hole for the third screw until after you make the final hinge and door alignments.

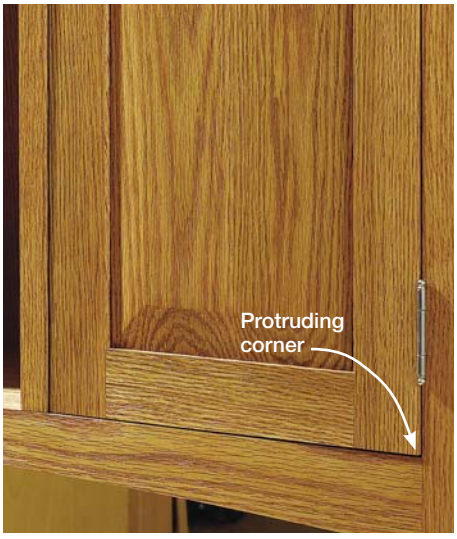
3 Tape your door spacer on the edge of the door at one end, as shown *above*. Turn the hinge upside down to use the barrel as an alignment guide against the front face of the door. As on the frame, drill the pilot holes at the centers of the two slots to allow for adjustments. Here, we're using a self-centering, spring-loaded drill bit. Then flip the hinge over and screw it into place, as shown at the top of *page 68*. Repeat this procedure for the remaining hinges.



4 Clamp a long, straight piece of scrap to the cabinet, extending it beyond the end of the lower rail. The top edge of this temporary support should rise approximately 1/16" above the lower rail to accommodate the gap. Rest the door on this support, as shown *above*, while driving top and bottom screws into the hinges. When installing bright brass hinges, you may want to cover the face with masking tape to avoid accidental scratches while driving the mounting screws.

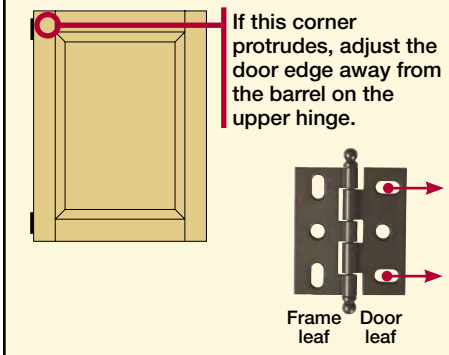

Adjust these screws to raise or lower the door within the opening.
Adjust these screws to move the door forward or back within the opening.

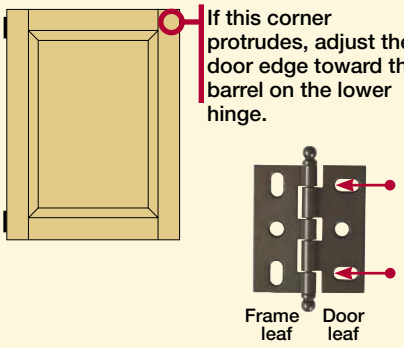
5 Remove the temporary support scrap from the bottom rail and close the door. Check the gap around all four sides, and use the hinge adjustment slots, shown *above*, to reposition the doors as needed. Once you achieve an even gap on the top and bottom and the door rests flush with the frame, drill a centered pilot hole and add a fifth screw to anchor the hinge in place on the frame. This still allows you to adjust the slant of the door within the frame.

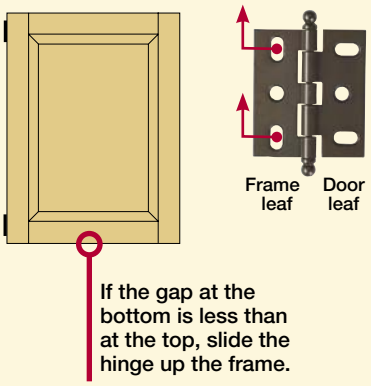


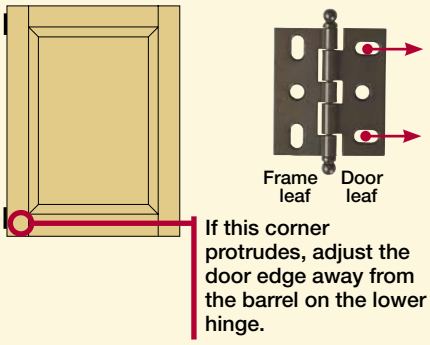
6 In time, the door or cabinet frame may change shape with different humidity conditions or as tensions within the wood are released. Use the adjustment slots on the hinges to correct for these problems as needed. To fix the protruding corner on the cabinet shown *above*, for example, slide the door away from the barrel of the lower hinge. For additional strategies to correct out-of-alignment doors, see "Getting the hang of it" on *page 72*.

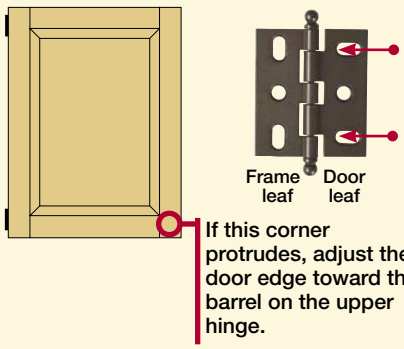
Getting the hang of it

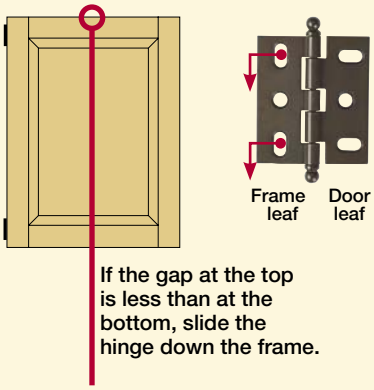




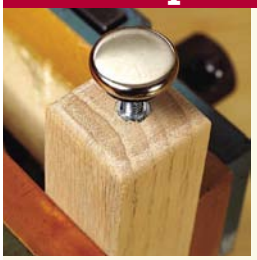








More tips for hanging doors quickly and accurately



■ Use screw-in levelers, like the one shown *left*, for cabinet legs on uneven floors to prevent racking that can cause doors to stick.

■ Don't use a sander to fine-tune the fit of your door; it's not a dimensioning tool. A sharp hand plane gives you greater control without rounded edges and wavy spots. Use your tablesaw and jointer only if you have the skill to be able to remove amounts of wood no greater than 1/64".

■ For doors that are wider than they are high, mount hinges within one hinge length of the top edge to avoid excess stress from the weight of the door.

■ Keep seasonal changes in mind when you're mounting doors. Depending on where you live, a 1/32" gap that looks tight but acceptable in the cool, dry air of January may disappear some hot, humid day in July. A rule of thumb for inset door gaps is 1/16", or roughly the thickness of a nickel. This allows for seasonal and humidity changes, and you may have all the shims you need among your pocket change. Give your door at least two coats of a film finish to slow the transfer of moisture into and out of the wood.

■ Before driving a solid brass screw, ream pilot holes by inserting and removing a steel screw of the same size. Then install brass screws using a hand screwdriver to avoid excess torque that might twist the screw in half, as shown *above*.

■ Add the cabinet back last. This gives you access to the interior for installing hinges and door catches or latches.

■ On projects with several doors, slight differences in door sizes are sometimes unavoidable. If an opening is slightly under- or oversize for one door, try others to see if you can make those door size variations work to your advantage.

■ If your door is slightly off plumb and the cabinet's vertical frame pieces are parallel, cut a shim the size and shape of your hinge leaf from a business card. If the door tilts clockwise, place the shim behind the lower hinge leaf that mounts on the cabinet. If it tilts counterclockwise, shim the same leaf on the upper hinge.

For slightly off-plumb doors, cut a shim from a business card and place it behind the frame leaf of the hinge.

monster routers

We test the beefiest, baddest bit-spinners on the block

You can't buy more powerful routers than the eleven models we put through their paces for this article. These machines have the ponies to plow large-diameter bits through hardwoods without flinching. Of course, such bits should never be used in a handheld tool. That's why you'll often find these units hanging around the shop inside a router table.

To give these extreme tools a real-world workout, we made raised-panel doors in red oak. This allowed us to compare power, cut quality, coarse- and fine-depth adjustments, and ease of bit-changing with each router mounted in a table.

For handheld use, we evaluated each tool while routing progressively deeper mortises, such as you might find where a table apron meets a leg. Except for the Milwaukee 5625-20 and the Porter-Cable 7518, all of the models are plunge routers, so during this test we also observed plunge smoothness and the ease of using locks, depth stops, etc.

The big five wish list for monster routers

Power. This is why you spend the extra money for a router in this class: Less-powerful routers just won't hold up under the strain of muscling a big bit through hardwood. So, to test the mettle of these tools, we used 3½"-diameter Freud raised-panel bits with back cutters (which machine a rabbet on the back of the panel at the same time) and routed a near-full-depth cut with each machine running at its lowest speed (8,000–12,000 rpm, depending on the tool).

That's a lot of hardwood to hog away, and nearly all of the routers passed this test with flying colors, bogging little if at all. Give credit to the electronic speed-control systems on these routers that sense an increasing load and automatically pour more power to the motor to compensate. Both Porter-Cable routers employ this circuitry, but had trouble settling on a speed—racing under load, over-correcting by slowing too much, and then speeding up again. A Porter-Cable official told us that the electronic feedback system on these two routers "is based on the electrical current draw, instead of motor speed like newer speed-control systems. It takes a little longer to respond and to find the optimal speed." Although we found it distracting, these speed swings didn't affect the quality of the cut.

Firm-gripping collet. If a router bit's shank slips in the collet, the bit can creep up or down causing inaccurate cuts. At worst, the bit can come out of the collet and pose a hazard. After installing the raised-panel bit, but before making any cuts, we marked index lines on both the bit shank and router collet to detect any vertical or rotational slippage. We were pleased to discover that none of the bits slipped during this test.

All of the routers come equipped with a ½" collet, although the design varies from tool to tool, as you can see from the photo, *below left*, and the chart on *page 79*. Four of the routers (Fein RT-1800, Festool OF2000 E-Plus, and both Porter-Cables) came with neither a collet or reducer sleeve for ¼"-shank bits. For these tools, you'll have to buy an accessory collet or sleeve for small-shank bits.

Clean cuts. With the first pass complete on all of our panels, we reset the fence to remove another 1/32" and made our final cleanup cuts with the raised-panel bits. We were impressed with all of the routers in this test: Each left a ripple-free, almost burnished surface. With no apparent difference in cut quality, we next measured collet runout (wobble) 2" above each collet using a precision-ground steel rod, and a dial indicator. None of the collets showed more than .004" of runout, and the best readings were half of that. Bottom line: All of these routers cut cleanly with a good, sharp bit installed.

Easy bit changes. To machine the rails and stiles of our raised-panel doors, we installed one half of a CMT rail-and-stile set in each router. The collets on the Bosch 1619EVS, Milwaukee, Porter-Cable 7518, and Triton TRC001 all raise high enough to change bits easily from above the table. The rest required at least one wrench (or a hand on the spindle lock) under the table. Table-mounted, the Festool gave us the hardest time changing bits; a protrusion on the base blocks wrench access. Festool's Dave McGibbon acknowledged our concerns, saying, "You have to release the plunge to change bits." However, we couldn't fit the raised-panel bit through the base opening, which measures 2⅞" on this tool. So we removed the router and insert plate from the router table to get the wrench in from the back of the machine.

Some of the tested routers require two wrenches for changing bits; others use a spindle lock (a push button or sliding plate) and one wrench. Triton's spindle locks automatically when raised to full cutting height for changing bits—a nice touch. The chart at the *end of the article* tells which routers use which system. One more note on

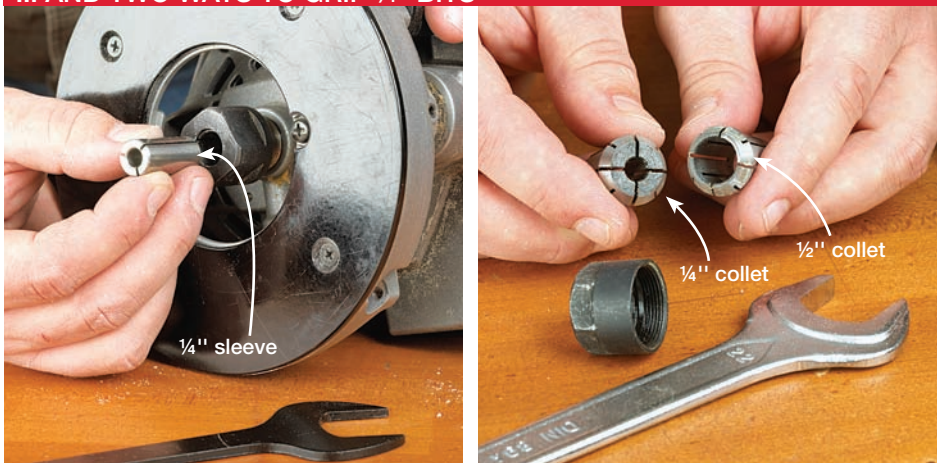
THIS BASE BLOCKS THE WRENCH

The accessory-mounting post on Festool's base restricts wrench access to the collet nut unless the router motor is lowered well below cutting depth, as shown here.

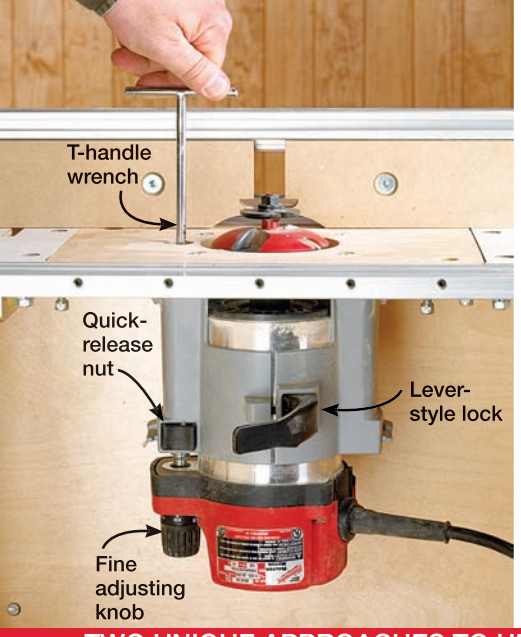
TWO ½" COLLET STYLES ...

A self-releasing steel collet "pops" the bit free after a full turn of the collet nut. One-piece collets occasionally failed to release a bit.

... AND TWO WAYS TO GRIP ¼" BITS



For ¼"-shank bits, these routers use either a reducer sleeve (*left*) that fits into the ½" collet, or a separate ¼" collet (*right*) that replaces it. We found no difference in grip or runout between the two styles. Compare, too, a stamped-steel wrench (*left*) and a sturdier cast wrench (*right*).



TWO UNIQUE APPROACHES TO HEIGHT ADJUSTMENTS

A wrench through the table raises and lowers the bit on the Milwaukee router (*above*), but you still have to reach under the table to lock and unlock the motor, and to make large changes with the quick-release nut.

Turning the "winder" on the Triton (*above*) adjusts the bit height, even raising it high enough to change bits from above. But our right-handed tester found it a little awkward because it's on the left side of the router.

wrenches: Bosch, DeWalt, Fein, Festool, and Milwaukee provide cast wrenches, which fit better, wear longer, and are more comfortable to use than the stamped-steel wrenches that come with the other routers.

Easy height adjustments. We found it easy to adjust the bit height on three tested routers when table-mounted: the Milwaukee, Porter-Cable 7518, and Triton. With the Milwaukee, adjustments are made from above the table, as shown at *far left*. The motor of the P-C 7518 threads up and down in its base, making large height changes fast, and fine adjustments precise. Triton's "winder" (a rack-and-pinion system built into one handle, shown at *near left*) is almost as fast as the P-C. The rest of the routers require lots of tedious turns of a smallish knob to make large cutting-height changes, except for the Bosch: It features a large fine-adjustment knob and plunge springs that can be defeated to eliminate resistance.

A lift for every router, and a router for every lift

Aftermarket router lifts are accessories that allow you to adjust bit height from above a table, but at a cost ($90–$430). This chart shows the most popular lifts on the market, and their compatibility with the routers in our test. Some combinations of router and lift will allow you to change small-diameter bits, such as straight bits, but not larger bits, such as panel raisers. (A wide-body bit can sometimes hinder wrench access.) Other lifts raise the collet high enough that bit diameter isn't an issue. Still others don't allow tabletop bit-changing at all, so you'll still have to reach underneath with wrenches.

ROUTER LIFT COMPATIBILITY

BRAND	MODEL	BENCH DOG PROLIFT, $370 800/786-8902, benchdog.com	JESSEM MASTRLIFT, $290 866/272-7492, jessem.com	JESSEM ROUTRLIFT, $200 866/272-7492, jessem.com	JOINTECH SMARTLIFT DIGITAL, $430 800/619-1288, jointech.com	ROUTER RAIZER RZ-100, $90 866/266-1293, routertechnologies.com	ROUTER RAIZER RZ-200, $90 866/266-1293, routertechnologies.com	WOODHAVEN EZ LIFT 1432, $165 800/344-6657, woodhaven.com	WOODPECKER PLUNGELIFT, $130 800/752-0725, woodpeck.com	WOODPECKER PRL, $290 800/752-0725, woodpeck.com	WOODPECKER UNILIFT, $290 800/752-0725, woodpeck.com
BOSCH	1619EVS			✓ X			✓ X		✓ X		
DeWALT	DW625			✓ X		✓ X			✓ X		✓ X
FEIN	RT-1800			✓ X			✓ X				✓ X
FESTOOL	OF2000 E-PLUS			✓ X							✓ X
FREUD	FT2000EPK			✓ X		✓ X			✓ X		✓ X
HITACHI	M12V			✓ X		✓ X			✓ X		✓ X
MAKITA	3612C			✓ X		✓ X			✓ X		✓ X
MILWAUKEE	5625-20		✓ ✈	✓ X				✓ |			✓ X
PORTER-CABLE	7518	✓ ✈	✓ ✈	✓ X	✓ ✈			✓ |		✓ ✈	
	7539			✓ X		✓ X			✓ X		✓ X
TRITON	TRC001			✓ X			✓ ✈				✓ X

✓ = Compatible | \| = Small-diameter bits only can be changed from above table | ✈ = All bits can be changed from above table | X = Bits cannot be changed from above table

When handheld, setting the cutting depth is simple and straightforward on the two fixed-base routers (Milwaukee and P-C 7518). For the plunge routers, we found the depth scales and stops easy to use and intuitive on most machines, but downgraded the Freud FT2000EPK and Makita 3612C because their scales couldn't be zeroed. Festool's scale reads easily and zeroes, but, marked only in millimeters, is of little value to inch-minded Americans.

More points that matter on these macho machines

Location of power controls. The Fein and Festool models earned high marks for having the power switch and speed control up front for readability and accessibility in table use. Because the Porter-Cable 7518's switch and speed control change location whenever the height is adjusted, we knocked off a few points.

Handheld, the power switch should be located where you can operate it without removing your hand from the handle. Trigger-style switches, such as those on the Bosch, Fein, and P-C 7539, work best in our book, but most others were within easy reach, too. Only the Porter-Cable 7518's switch, which changes location with the cutting depth, sometimes required removing one hand from a handle to operate it.

Dust control. We used a shop vacuum connected to a fence-mounted dust port for our panel-raising cuts, and then compared the amounts of dust in the vacuum canister and inside our closed-base router table at the end of the cutting. The Triton router allowed the least amount of dust inside the table; the Porter-Cable routers had significantly more chips in the table than in the vac, some of them lodging in the air intake for the motor, suggesting dust penetration that could shorten the motor's life.

For handheld use, many of the routers include above-the-base dust shrouds and ports that proved quite effective. Hitachi and Milwaukee don't offer any dust-collection accessories for their tools; Makita sells an optional port for $23. Bosch, Festool, and Porter-Cable offer optional below-the-base dust-collection accessories for use when routing edge treatments.

Guide-bushing use. We gave high marks to routers that come with one or more guide bushings for template routing. Downgrades went to routers that didn't include bushings but would accept Porter-Cable-style guide bushings out of the box. Our lowest grades went to tools that required the purchase of accessory adapters or a subbase to use guide bushings.

Monster routers compared head to head

Bosch 1619EVS, $310
877/267-2499, boschtools.com

High points
- The plunge springs and lock can be temporarily disabled to ease cutting-depth changes when table-mounted.
- Two-stage depth-setting system—one knob for coarse depth changes, another for fine adjustments—works faster than on most plunge routers.
- Extension knob for fine-tuning cutting depth under the table comes with this router.

Low points
- The motor slowed momentarily while routing with a raised-panel bit.
- Unless supported by hand, the motor can drop (but not fall out) when making coarse depth changes under-table.

More points
- Trigger-style power switch is well located for handheld use, but is more difficult to engage under the table than sliding switches or toggles.
- Quick-change guide-bushing mount is handy, but Bosch bushings or an adaptor for P-C style bushings must be purchased separately.

DeWalt DW625, $200
800/433-9258, dewalt.com

WOOD MAGAZINE TOP TOOL APPROVED
HANDHELD

High points
- Top-notch depth-setting system for handheld use: rack-and-pinion depth stop, fine adjustability, and a magnified cursor that zeroes easily.
- Plunge action is smooth and light spring tension is easy (but not too easy) to overcome.

Low points
- Bit-height adjustments under the table are tedious. There's no coarse adjustment, and the fine-adjustment knob is close to the router's body. (Accessory extension knob costs $25.)
- Although the manufacturer claims a soft-start motor, we really felt the torque when powering up this router while handheld.

More points
- We like this router for handheld use, but not as a table-mounted tool.

Fein RT-1800, $310
800/441-9878, feinus.com

High points
- Earned high marks in most handheld performance tests.

Low points
- Bit-height adjustments under the table are tedious. There's no coarse adjustment, and the fine-adjustment knob is close to the router's body. (Accessory extension knob costs $25.)
- ¼" collet not included in price.

More points
- Trigger-style power switch is located well for handheld use, but is more difficult to engage under the table than sliding switches or toggles.
- Rack-and-pinion depth stop sets easily but lacks fine adjustment, and the stop rod tended to move when zeroing the scale.
- Like the DeWalt, the RT-1800 would be a good choice for a handheld router, but there are better routers for table mounting.

Festool OF2000 E-Plus, $475
888/337-8600, festoolusa.com

High points
- Easily accessible and visible speed control and power switch when the router is mounted in a table.

Low points
- Bit-height adjustments under the table are tedious. There's no coarse adjustment, and the fine-adjustment knob is close to the router's body.
- Router must be lowered when changing bits in the table to get the wrench past a base protrusion.
- The most expensive router in the test, and a ¼" collet is not included.

More points
- The depth-stop rod can be zeroed and is easily adjusted to fine-tune the cutting depth. However, the scale is graduated in millimeters.

Freud FT2000EPK, $200

800/334-4107, freudtools.com

TOP VALUE APPROVED

High points

- Low-priced and the lightest-weight router in our test with no compromise in power or cut quality.
- Power and speed controls are easily accessible both handheld and when table-mounted.

Low points

- The depth-stop scale can't be zeroed, and the magnified cursor is difficult to read if not viewed straight on.
- Guide bushings or adapter for P-C-style bushings must be purchased separately.

More points

- This tool has no coarse depth adjustments under the table, but the large fine-adjustment knob clears the router body to ease this tedious task.
- Available in a kit (PKG0026) that includes a router table, insert plate, and fence system for $400.
- Although this router will remain in Freud's lineup, a new 3-hp class router (model FT2200) is expected to hit the street in late 2005.

Hitachi M12V, $195

800/829-4752, hitachipowertools.com

TOP VALUE APPROVED

High points

- The rack-and-pinion depth-stop system proved one of the easiest to set and use.
- Handles can be rotated to any of three positions to suit the user or the situation.
- Low price includes an adapter for use with P-C-style guide bushings.

Low points

- No dust-collection accessories are provided with or available for this router.
- Tedious bit-height adjustments under the table: There's no coarse adjustment, and the fine-adjustment knob is close to the router's body. (Accessory extension knob costs $25.)

More points

- We could run a 3½"-diameter bit in the M12V with the collet extended beyond the base. However, mounting tabs for guide bushings prevent bits larger than 2" from passing through the base.

Makita 3612C, $240

800/462-5482, makitatools.com

High points

- Plunge action is smooth and light spring tension is easy (but not too easy) to overcome.
- The 3612C is the only router we tested with an electric brake that slows the bit at power-down.

Low points

- Guide bushings not provided, and you can't get an adapter for P-C-style guide bushings.
- We found the depth-of-cut scale (molded into the router body) difficult to read. Also, the scale can't be zeroed to easily set plunge depth.
- When table-mounted, the spindle lock is on the back side of the router.

More points

- No dust collection provided, but optional above-base shroud ($23) proved effective.
- This router lacks coarse depth adjustments under the table, but the large fine-adjustment knob clears the router body to ease this task.

Milwaukee 5625-20, $330

800/729-3878, milwaukeetool.com

TOP TOOL APPROVED

TABLE-MOUNTED

High points

- The only router in this power class that provides through-the-tabletop adjustment for cutting depth, a feature we quickly grew to love.
- Collet raises high enough to change most router bits from above the table.
- Clear subbases (one for P-C guide bushings, and the other with a larger opening) provide a good view of the bit when routing handheld.
- Two-stage depth-setting system (a quick-release nut for large depth changes, and a knob for fine adjustments) proved effective and accurate both handheld and table-mounted.

Low points

- Motor can drop out of base if unsupported when making large depth changes under the table.
- 1¾" cutting-depth range is the least of the tested machines.
- No dust-collection accessories are provided with or available for this router.

More points

- One of only two fixed-base routers in our test; field cuts are more difficult without plunge action.
- Pistol-grip handles can be replaced with included ball-shaped handles if the user prefers.

Porter-Cable 7518, $310

800/487-8665, porter-cable.com

High points

- The motor threads up and down inside the base for cutting-depth changes both rapid and accurate, whether handheld or table-mounted.
- Collet raises high enough to change most bits from above the table.

Low points

- Location of power switch and speed control varies with cutting height when mounted in a router table.
- When table-mounted, our shop vacuum couldn't overpower the tool's fan, which pulled some debris into its air intake.
- ¼" collet is not included.

More points

- The motor has five fixed speeds rather than continuous variable speed. Motor speed fluctuated under duress, but didn't seem to affect cut quality.
- One of only two fixed-base routers in our test; field cuts are more difficult without plunge action.
- This router's motor works in more router lifts than any other router.

Porter-Cable 7539, $320

800/487-8665, porter-cable.com

High points

- Good depth-setting system for handheld use features six turret stops, microadjustability, and an easy-to-read scale.

Low points

- At nearly 18 pounds, this is the heaviest tool in our test.
- No coarse depth adjustments for router-table use, and the fine-adjustment mechanism requires a wrench or extension knob ($25), neither of which comes with the router. Also, plunge lock must be held open during height adjustments.
- And when table-mounted, our shop vacuum couldn't overpower the tool's fan, which pulled some debris into its air intake.
- ¼" collet is not included.

More points

- The motor has five fixed speeds rather than continuous variable speed. Motor speed fluctuated under duress, but didn't seem to affect cut quality.
- Trigger-style power switch is located well for handheld use, but is more difficult to engage under the table.

11 EXTREME ROUTERS: MAKING THE CUT, MAKING THE GRADE

BRAND	MODEL	BASE TYPE (PLUNGE OR FIXED)	MOTOR SPEED RANGE (RPM X 1,000) (1)	SWITCH TYPE (2)	MAXIMUM BIT DIAMETER (INCHES) (3)	BASE SHAPE (4)	BASE TIGHTENING METHOD (5)	BASE ½" COLLET STYLE (6)	BASE ¼" COLLET STYLE (6)	COLLET RANGE (INCHES)	CUTTING DEPTH ADJUSTMENT MECHANISM (7)	CUTTING DEPTH NUMBER OF TURRET STOPS (8)	PERFORMANCE GRADES (9) IN-TABLE USE: OBSERVED POWER	IN-TABLE USE: EASE OF ADJUSTING BIT HEIGHT	IN-TABLE USE: EASE OF BIT CHANGING	IN-TABLE USE: LOCATION OF CONTROLS (ON/OFF AND SPEED)	IN-TABLE USE: DUST CONTROL	HANDHELD USE: BALANCE AND CONTROL	HANDHELD USE: EASE OF SETTING DEPTH	HANDHELD USE: SWITCH LOCATION	HANDHELD USE: PLUNGE SMOOTHNESS	HANDHELD USE: DUST CONTROL	HANDHELD USE: VIBRATION	HANDHELD USE: GUIDE BUSHING USE	NOISE LEVEL (dB) (10)	CORD LENGTH (FEET)	ACCESSORIES (11) STANDARD	ACCESSORIES (11) OPTIONAL	WARRANTY (YEARS)	COUNTRY OF ASSEMBLY (12)	WEIGHT (POUNDS)	SELLING PRICE (13)
BOSCH	1619EVS	P	8-21	TR	3¾	D	L	S	S	2¾	TR	8	B	B+	A-	B-	B	A	A	A	A-	A	A	C	94	9	A,K	B,E,G	1	U	13.8	$310
DeWALT	DW625	P	8-22	TO	2⅜	D	L	S	S	2 7/16	TR	3	A	C	B	B	C	A	A	A-	A	A	B	B+	96	8	A	E,K,G	3	I	14.1	$200
FEIN	RT-1800	P	8-22	TR	3	D	L	S	N/A	3	TR	3	A	C	B	B-	C	A	B	A	A-	A	A	B+	94	9	A	E,K,Q	1	I	12.9	$310
FESTOOL	OF2000 E-PLUS	P	12-22	TO	2⅞	D	L	S	N/A	2½	TR	3	A	C	C	A	C	A	C	A	B	A	B	A	98	13	A,C,E,G	B,Q	3	G	12.9	$475
FREUD	FT2000EPK	P	10-22	TO	2⅞	D	L	S	S	3	TR	3	A	C+	B	A	B	A	B-	A	B-	A	B	C	98	7½	A,C,E		5	S	11.9	$200
HITACHI	M12V	P	8-20	TO	2	D	L	O	R	2 7/16	TR	2	A	C	B-	B	B	A	A	A	B	D	A-	A	98	7½	E,G,S	K	5	M	12.9	$195
MAKITA	3612C	P	9-23	TO	2⅞	R	L	S	R	2⅜	TR	4	A	C+	B	B	B	A	B-	A	A	B	A-	C	95	8½		A,E,G	1	U	13.5	$240
MILWAUKEE	5625-20	F	10-22	R	4⅛	R	W	S	S	1¾	TR	N/A	A	A	A	A-	B	A	A	B+	N/A	D	B	B	95	7½		G	5	U	12.3	$330
PORTER-CABLE	7518	F	10-21*	R	3½	R	W	S	N/A	3	RM	N/A	C	A	A	C	D	B-	A	C	N/A	D	A	B	97	8		B,E,G,Q	1	U	16.0	$310
	7539	P	10-21*	TR	3½	R	W	S	N/A	3	TR	6	C	C	B+	B-	D	B	A	A	B	D	A	B	98	8		B,E,G,K,Q	1	U	17.6	$320
TRITON	TRC001	P	8-21	R	3⅛	R	L	O	R	3¼	RP	3	B	A	A	B+	A	B-	A	A-	A-	A	A	C	94	6½	A,E,S	G	1	T	14.1	$310

NOTES:

1. (*) Five fixed speeds ranging from 10,000 to 21,000 rpm.
2. (R) Rocker
   (TO) Toggle
   (TR) Trigger
3. With subbase removed. All accept larger-diameter bits above the base when installed in router table.
4. (D) D-shape
   (R) Round
5. (W) Two wrenches
   (L) Spindle lock and wrench
6. (O) One-piece collet
   (R) Reducer sleeve
   (S) Self-releasing collet
   (N/A) ¼" collet is optional
7. (RM) Rotate motor in base
   (RP) Rack & pinion
   (TR) Threaded rod
8. (N/A) Fixed-base router; no turret stops
9. A Excellent
   B Good
   C Fair
   D Poor
   N/A Fixed-base router; does not apply
10. Measured 24" from router running at highest speed, under no load.
11. (A) Above-base dust collection
    (B) Below-base dust collection
    (C) Case
    (E) Edge guide
    (G) Guide bushing
    (K) Extension knob
    (S) ½" straight bit
    (Q) ¼" steel collet with nut
12. (G) Germany
    (I) Italy
    (M) Malaysia
    (S) Spain
    (T) Taiwan
    (U) United States
13. Prices current at time of article production and do not include shipping, where applicable.

Triton TRC001, $310

888/874-8661, tritonwoodworking.com

High points

- Ranked top in our test for bit changing while table-mounted: Collet raises high above the tabletop, spindle locks automatically, and power switch locks out to prevent accidental startup.
- Two-stage depth setting for in-table use: One handle (the "winder") uses a rack-and-pinion action for coarse adjustments, and a fine-tuning knob provides minute adjustments. Plunge spring can be removed with one screw to eliminate resistance.
- Dust shields remain in place when table-mounted, so most of the chips evacuated through the fence in our test.

Low points

- High-mounted handles and round knobs make this router feel a little top-heavy in handheld use.
- Winder handle is on the left when table-mounted; an awkward location for right-handed users.
- If you use a remote start switch in your router table, you'll need to manually throw the TRC001's power switch to "off" to take advantage of the automatic spindle lock when changing bits.

The tool you choose hinges on its use

Before you decide on a router, first decide whether you'll use it primarily handheld, in a table, or both. If you're looking to amp-up your router table, go for the Milwaukee 5625-20, our Top Tool Table-mounted. Through-the-table height adjustments and above-the-table bit changes on this router will save you the hassle and expense of adding a router lift to get that same functionality.

For primarily handheld use, the DeWalt DW625 and Bosch 1619EVS are about equal in the key performance areas, but the DW625 costs $110 less, so we named it our Top Tool Handheld. If you want a tool that can go both ways, the Bosch 1619EVS and Triton ran neck and neck, even pricewise.

For Top Value honors, the battle between the Freud FT2000EPK and Hitachi M12V is a dead heat. For $200 or less, both deliver plenty of power, good cut quality, and are backed by five-year warranties. Either will serve the budget-conscious woodworker well.

Written by **Dave Campbell** with **Jeff Hall**

box-top magic

Discover the tricks and jigs that pioneering box-maker Al Ladd uses to create his captivating box tops, and you'll see why he's truly one of the best.

With their shop and home in the background, New Englanders Marilyn Beal and Al Ladd show off some of the finest box designs in their collection. Clockwise from top left, the box styles include Arts and Crafts, Amish Quilt, Crescent Inlay, Brazilian Tulipwood, and Running Pelta.

Although many woodworkers only dream of becoming a professional while living in some idyllic rural setting, box-maker Al Ladd succeeded. But his journey was met with hardship and a learning curve that bent sharply into the stratosphere. Having now prospered for more than 20 years in the business, the 46-year-old brims with woodworking wisdom, along with a knack for problem-solving that relies on shop scraps and implementing an array of clever ideas.

Al developed his skills and design sense at making jewelry boxes, keepsake boxes, and cutting boards during the 1980s. In 1988, he moved into the woodsy hills of Colrain, Massachusetts. His first residence was the barn at top left in the photo *above*. This he remodeled into his 30×40' first-floor workshop. While polishing his box-making skills and growing the business, he built the cedar-shingle two-story house next door, with help from his partner in life Marilyn Beal.

Rustic romance story aside, we paid a visit to Al and Marilyn's place to witness firsthand the craftsman's ingenuity at designing and constructing the most appealing part of a box—its top. We'll begin by probing Al's secrets for a successful box design, and then take a close look at how he fashions his Amish-style end-grain box top, and the attractive onlay banding on some of his other box designs. We'll even check out the smallest entries in his box line. Enjoy.

What makes a great jewelry box?

In Al's words, here are the features that make his boxes so special:

Function first. "The box must perform its intended function so well that it's a pleasure to use. Function should determine the basics, such as size, and whether or not it is hinged. There's no single perfect form or size, only what's best for its purpose. Larger boxes—that is, jewelry boxes as opposed to keepsake boxes—will require dividers, trays, and/or drawers to make storage secure and accessible."

Lasting Durability. "A great box should be built for the ages. Perhaps more than any other piece of woodworking, a jewelry box can be an intimate heirloom passed down from generation to generation. To succeed, you need to understand wood movement issues, especially on a larger, more complex piece." (See "How to tame end-grain panel movement" on *page 82* for more on this subject.)

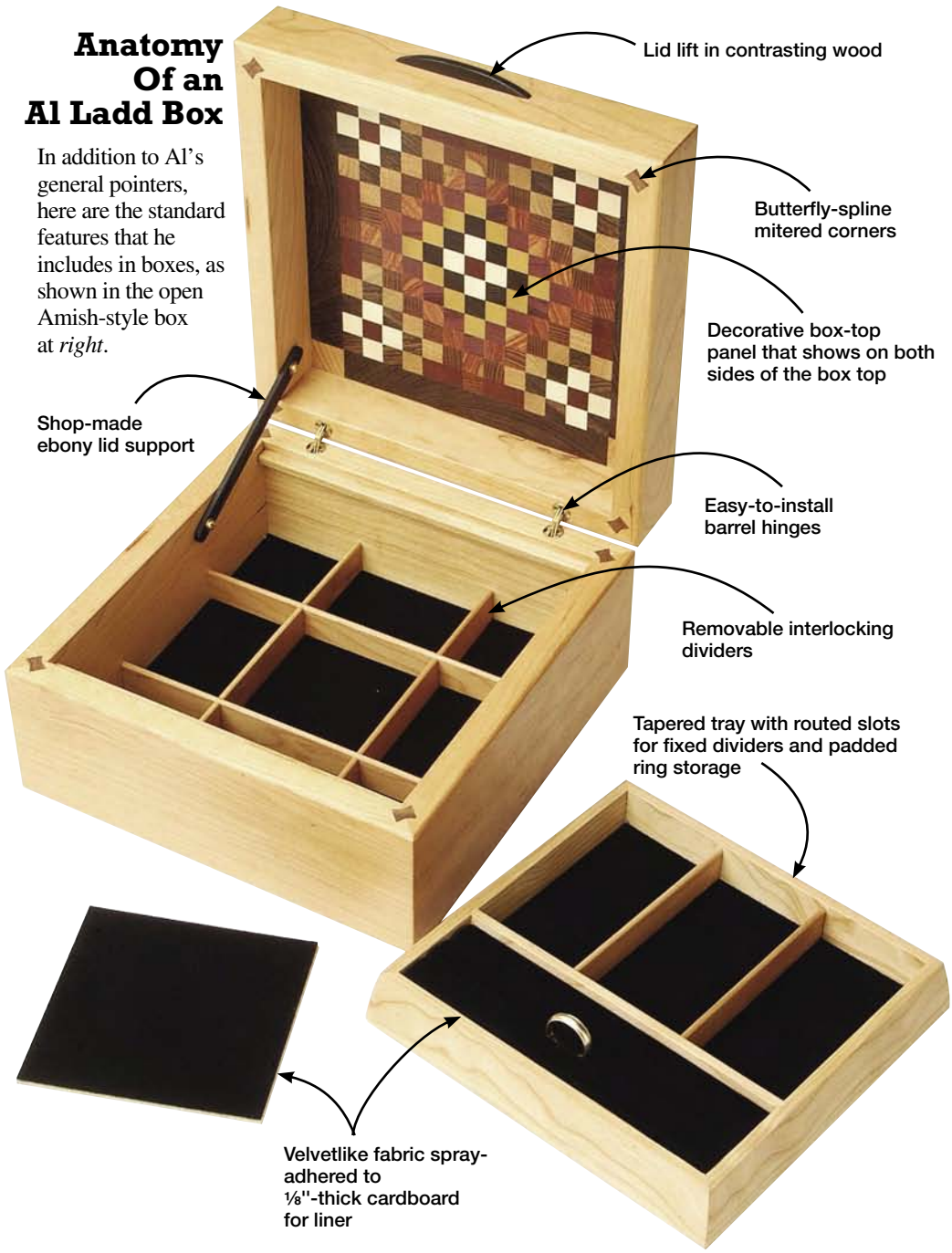
Fine Joinery. "This is one key to achieving a box that lasts. A jewelry box is the perfect place to showcase unusual joinery, such as my butterfly-spline miters, or other techniques that the maker is most proud of." (See examples of this joint in the box at *right*.)

Fancy Woods. "A great jewelry box should be built from extraordinary woods, whether it's that oak that came down in the storm, or some curly cherry and ebony. I spare no expense to get the right mix of woods in my designs, both exotic and native American hardwoods." (See the collection of Al's favorite woods *below*.)

Signature Looks. "Every truly great jewelry box should bear the distinctive mark of its maker. That might require some experimentation and risk-taking. Don't be afraid to make a few mistakes on the road to making your perfect box. In many cases, I team-design my boxes with Marilyn, who has an art background."

Anatomy Of an Al Ladd Box

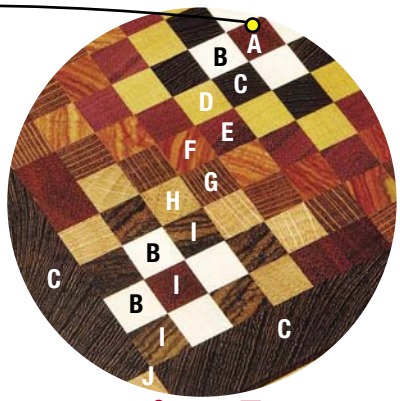
In addition to Al's general pointers, here are the standard features that he includes in boxes, as shown in the open Amish-style box at *right*.


Lid lift in contrasting wood
Butterfly-spline mitered corners
Decorative box-top panel that shows on both sides of the box top
Shop-made ebony lid support
Easy-to-install barrel hinges
Removable interlocking dividers
Tapered tray with routed slots for fixed dividers and padded ring storage
Velvetlike fabric spray-adhered to ⅛"-thick cardboard for liner

Extraordinary woods = eye candy

Al's inventory of wood spans more than 40 species—some quite rare—which he stores in a 8×6×22' attached shed alongside his shop. This sampling shows a few of his favorite woods.

Al's "Arabian Chest" features the most sophisticated box top he has attempted. It contains ten wood species, repeating a complex triangular design unit many times. While many of his jewelry boxes retail for about $750, this one sold in a gallery for more than $2,000.



KEY

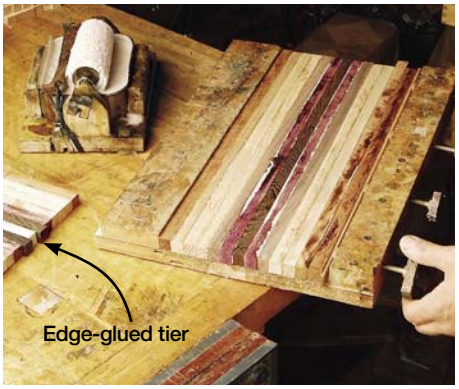
(A) Blood Wood
(B) Holly
(C) Wenge
(D) Brazilian satinwood
(E) Purpleheart
(F) Brazilian tuliwood
(G) Leopardwood
(H) Red Oak
(I) Zebrawood
(J) Honey Locust

Making an end-grain box-top panel

Due to end grain's texture, Al sees it as having superior eye appeal when compared to face grain. Here, the end-grain mosaic of an Amish quilt design in the box top *above* and cutting board, *right,* serve as examples. Before we launch into Al's technique for the box-top panel, read through his tips *bottom right* for dealing with wood movement. Because wood moves mostly across its width and thicknes, this issue is one of Al's top concerns.

His multicolor Amish box top, features the end grain of ten species of wood. Note the key listing these woods *above*. However, before trying a frame-and-panel box top, you may want to experiment with a simpler cutting board, *shown right*, another one of Al's specialties. The process is essentially the same.

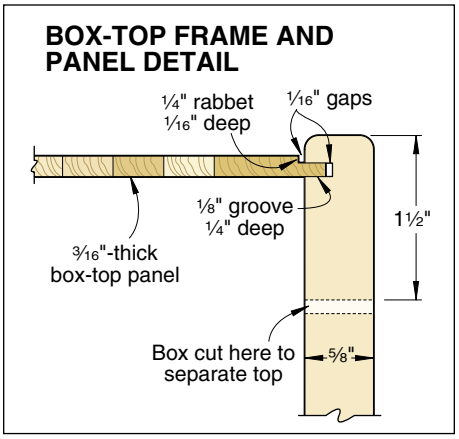
STEP 1: Al begins his box-top panel by cutting a variety of wood species into square lengths and stacking them into small piles. He then uses his shop-made applicator—a paint roller suspended over a tray of glue—to wet mating lengths of wood with glue.



STEP 2: He places the lengths of wood in an established order in his edge-gluing jig. He applies even pressure to the glue-up by turning the knobs on the jig and driving four small wood cylinders against the wood. The end result: an edge-glued "tier."

STEP 3: After gluing up 13 patterned tiers, he scrapes and planes them clean, and then glues up the tiers in groups of six or seven into perfectly aligned "half blocks." For this, he places the tiers in his clamping press, applying even pressure across the lamination.

STEP 4: Al cleans up the half blocks, and then glues them to mating half blocks to make "whole blocks." He borders the blocks with wenge (the dark strips) and honey locust at the corners. Then, for efficiency, he glues two whole blocks together, separating them with waste wood. Finally, he bandsaws the "double blocks" into box-top slabs—enough for several boxes.



STEP 5: Al drum-sands each box-top slab to 3/16" thick, and then saws them into two usable panels. He cuts a ¼" rabbet 1/16" deep around the edges of the panel and inserts it into the grooved box sides during assembly. Finally, the box top is cut free of the box where shown.

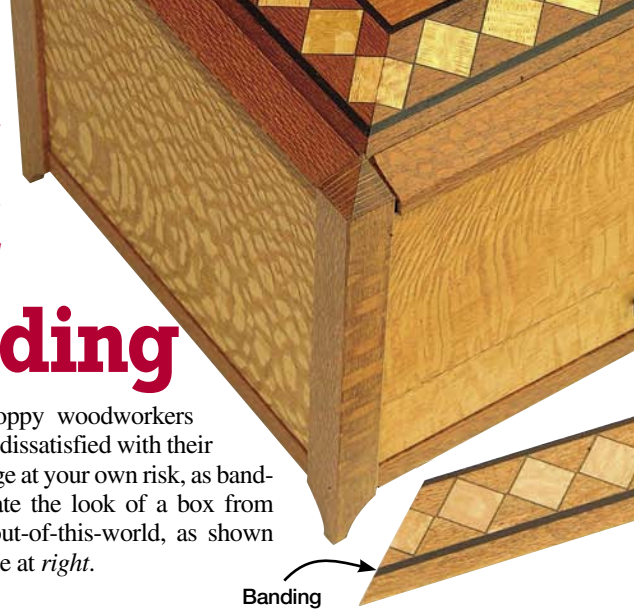
How to tame end-grain panel movement

■ "Choose woods with similar wood movement properties, and keep the panels small enough to withstand stresses brought on by dimensional changes. I like my wood dried to 6- to 8-percent moisture content." To help him determine the amount of wood movement due to changes in MC, Al uses the Lee Valley Wood Movement Reference Guide, ($5.50, #50K24.01; visit leevalley.com or call 800/871-8158).

■ The thinner the panel, the smaller it must be to remain intact. Jewelry box-top panels should be no more than 9" in length, with end-grain panels measuring ¼" thick.

■ Once rabbeted, place the end-grain panel in the side grooves during assembly, letting it float. **Do not glue it in place.** Al sizes rabbets to allow for a tight, rattle-free, friction fit.

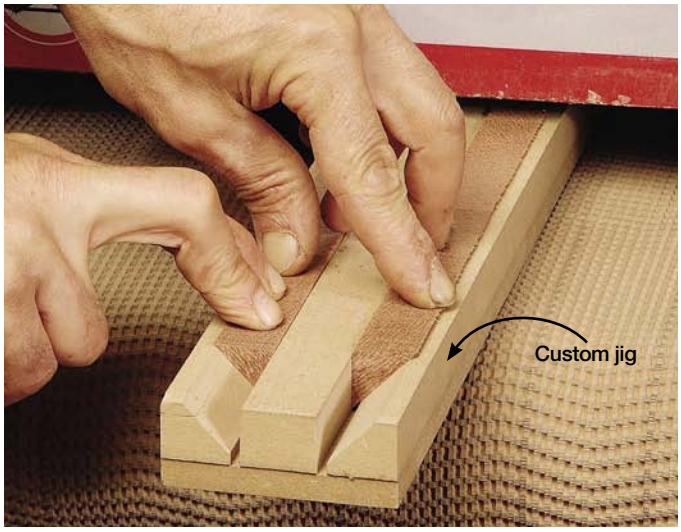
"I challenge myself to create beautiful things, doing complex work with great precision. Box-making with banding opens up a world of possibilities."
— Al Ladd



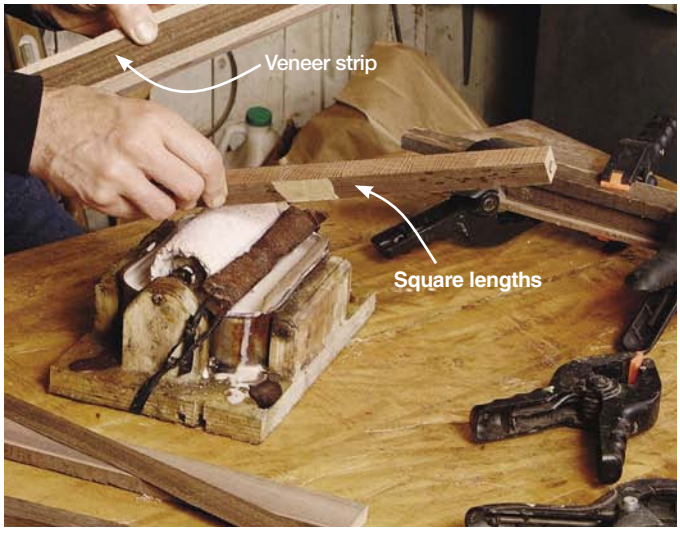
Introducing onlay banding

Adding a decorative banding to border a box top takes patience, precision machining, strict adherence to a symmetrical design, and a goodly measure of fussing. Here, we'll focus on Al's method for "onlay" banding, which is adhered along the beveled substrate material—in this case, Baltic birch plywood. Be warned: Perfectionists love the demands of making and applying banding; easily frustrated, sloppy woodworkers may wind up dissatisfied with their results. Indulge at your own risk, as banding can elevate the look of a box from ordinary to out-of-this-world, as shown in the example at *right*.

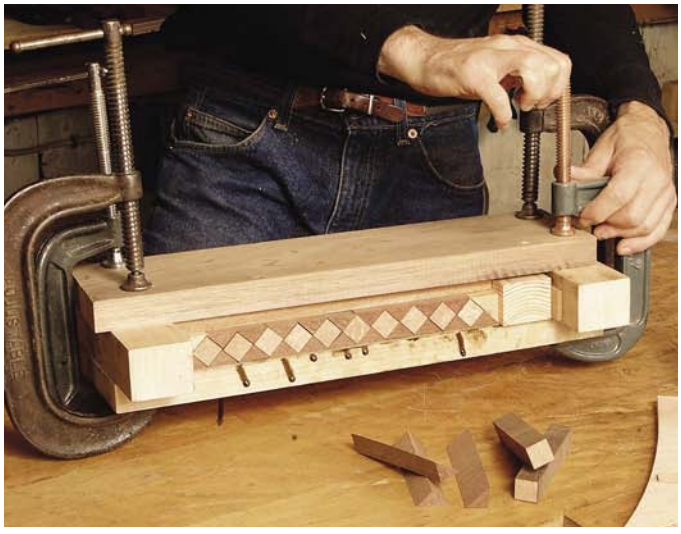
STEP 1: To make the banding shown at ***top right***, Al first prepares the stock for several box tops. From a leopardwood board, he bandsaws triangular lengths, *above*.To make the diamonds, he rips and planes square lengths that were crosscut from a wide lacewood board. These will be surounded by thin commercial veneer strips.



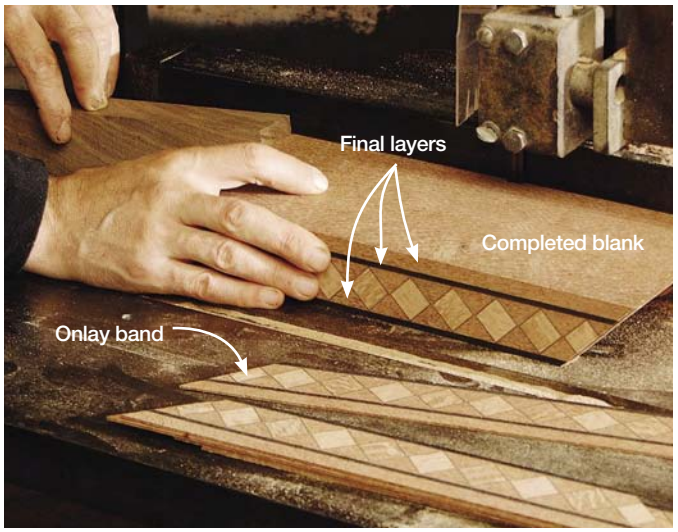
STEP 2: To remove saw marks and to finish-size the triangular lengths, Al places them in his custom 45° planing jig and runs them through the drum sander. Here, he presses the lengths into the jig's V-grooves to keep them from moving around while being fed into the machine.



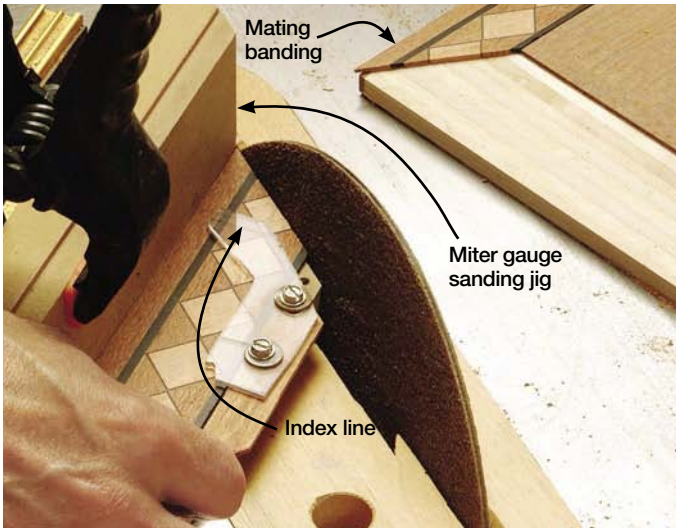
STEP 3: Al returns to the square lengths, wets opposing faces with glue, and covers them with contrasting veneer strips. He then sandwiches the glue-up between cauls and applies clamps for a solid bond. All four faces will receive veneer, which later will serve as an attractive accent.



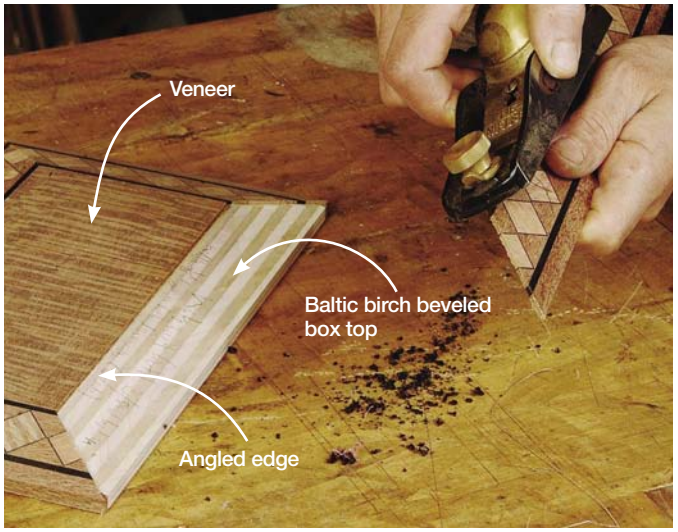
STEP 4: With all the stock prepared and veneer added, Al builds the banding blank, applying glue and placing the pieces in order in a special set-up of clamping cauls. Here, he'll assert clamping pressure from top to bottom. In this defined space, he ensures tight seams between the evenly spaced square lengths.



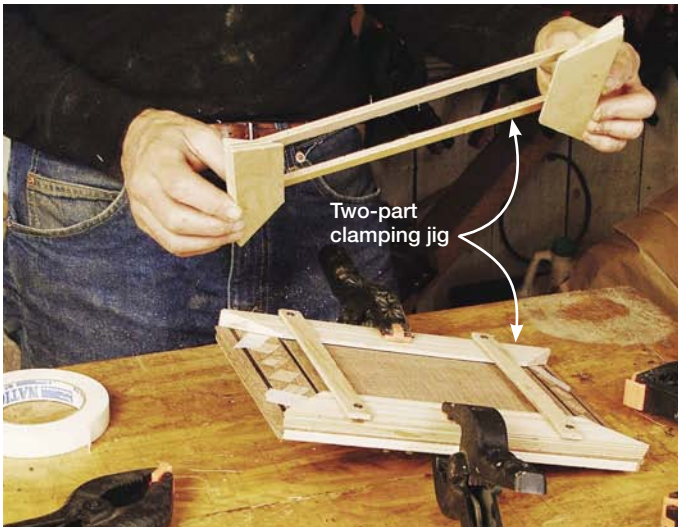
STEP 5: Al glues on three more layers of wood to complete the blank; then, like slicing cheese, he bandsaws 1/16" strips of onlay banding. Using this production shop approach, he can create a large batch of onlay banding strips, allowing him to adorn several box tops with the same design.



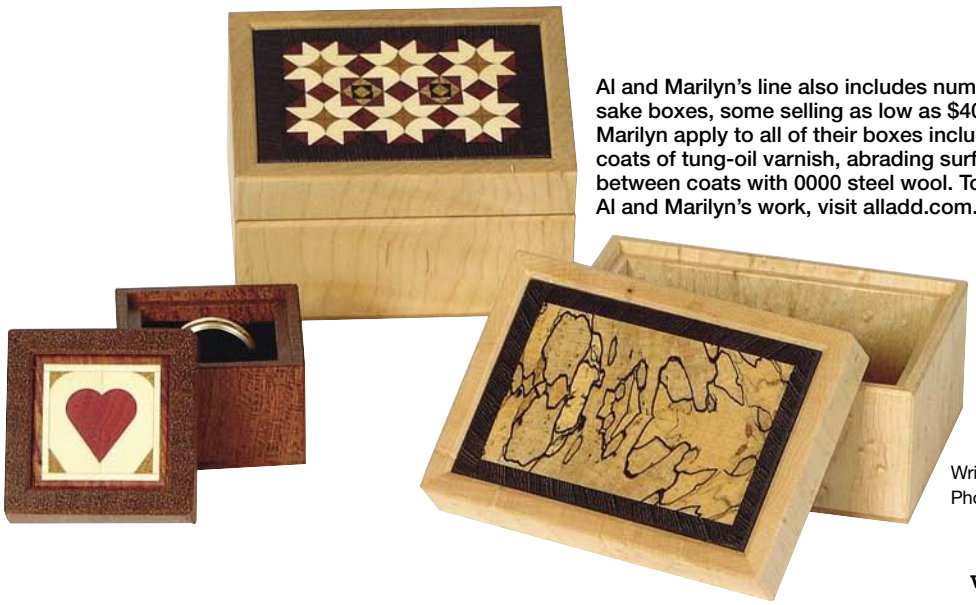
STEP 6: Now comes the fussing part: fine-tuning the mitered ends of the banding using a miter gauge jig and a tablesaw-mounted sanding disc. Note how the index line on the jig aligns where two squares meet. This ensures that the sanded mitered end of the banding matches the mating banding almost perfectly.



STEP 7: The fussing continues as Al uses a block plane to shave a slight angle on the short edge of the onlay banding. He does this for a dead-on fit against the raised angled edge of the veneered box-top center and perfect aligment of the corner squares.



STEP 8: After fine-tuning the fit of the banding on the box top, Al tapes the four pieces together at the corners, applies glue, and clamps them in place, employing a companion pair of clamping jigs and spring clamps. Now only light sanding and finishing remain.



Al and Marilyn's line also includes numerous small keepsake boxes, some selling as low as $40. The finish Al and Marilyn apply to all of their boxes includes two to three coats of tung-oil varnish, abrading surfaces between coats with 0000 steel wool. To see more of Al and Marilyn's work, visit alladd.com.

Written by **Jim Harrold**
Photography: **Jack Holowitz Photography**

success strategies for figured wood

How to make the most of fancy grain

Whether you choose the distinct ray flecks in quartersawn oak, the glowing waves of curly maple, or the feathers of crotch walnut, using figured wood ranks as a beautiful way to spice up your projects. But working with figured wood poses challenges. Here's what you need to know to enjoy success.

The origin of figure: wood grain gone wild

Trees annually grow rings of fibers that run along the length of the trunk and branches. Slicing a tree into logs cuts through these rings to reveal the broad Vs and straight lines of "normal" grain figure. Some fibers bend around knots, spiral, form wavy patterns, or grow randomly. When these conditions occur, figured grain results.

Even scientists don't understand what causes some of these patterns. Birds-eye swirls, for example, occur in less than one percent of maple trees.

Rarity puts figured stock prices on the rise

The scarcity of figured wood means you aren't likely to find it stocked by everyday wood merchants. High demand from veneer manufacturers quickly depletes figured-stock supplies. Thankfully, mail-order sources are abundant. We've listed a few of our favorites at the end of the article.

Prepare for sticker shock on figured stock, which may fetch prices three or more times higher than "normal" boards of the same species. (We recently paid $17 per board foot for curly maple, while standard soft maple costs about $5.50 in our area.)

Fortunately, areas of figured grain often appear in ordinary boards. The walnut shown in the photo at *right* came from the knotty end of a run-of-the-mill walnut board. What many people would consider waste instead became a gorgeous panel.

Figure unusual grain into your project designs

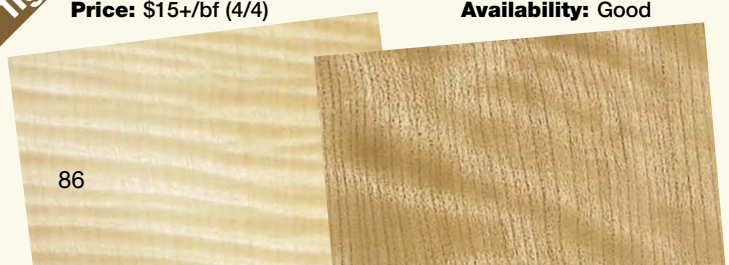
High cost dictates that woodworkers use figured stock sparingly, so plan carefully how to use it in projects. Small items, such as the jewelry box, *above left* (issue 157, page 88), can be built entirely of figured stock without breaking your budget. On large furniture pieces, consider figured stock for creating accents, such as door panels, drawer fronts, inlays, and pulls. A few well-placed pieces can transform a project from mundane to magnificent. Just don't overdo it. Highly figured stock can overpower the design of a piece.

Fantastic flame figure in this walnut comes to life when resawn and book-matched. Patience and a bandsaw are all you need.

5 common figure patterns

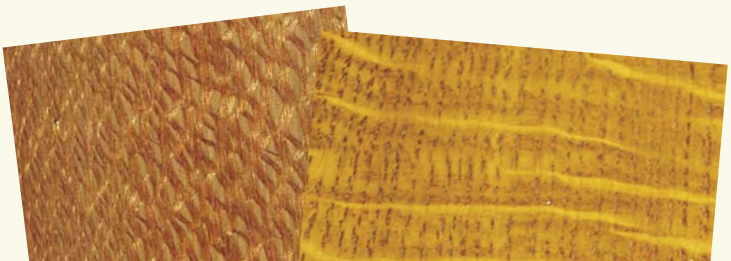
CURLY This wood becomes rarer and more valuable as the waves get closer and more consistent. Especially tight waves earn the "fiddleback" designation. Curly maple (left) ranks as the most common, though this figure can show up in walnut, mahogany, cherry (right), and other species.

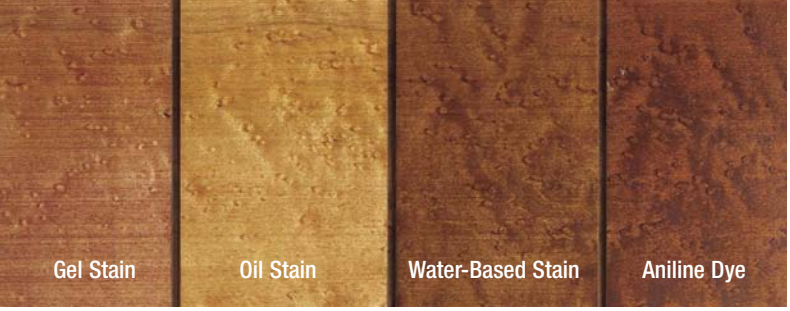
Price: $15+/bf (4/4) **Availability:** Good



RAY FLECK Quartersawing some woods reveals prominent ray cells that run perpendicular to grain lines. Red and especially white oak (shown at right) are the most common examples, though woods such as lacewood (shown at left) and sycamore often exhibit flecking when cut this way.

Price: $1 or more per bf more than nonfigured **Availability:** Good





DYE BRINGS OUT THE FIGURE

Birds-eye swirls show on the samples colored using cherry stain, but the aniline dye brings out more subtle details and depth.

ANY CLEAR FINISH MAKES FIGURE POP

Five different clear finishes yield acceptable results on this birds-eye maple, giving your project protection without sacrificing appearance.

Machining tricks that minimize hassle and waste

Most of us won't hesitate to plane average stock to get thin lumber. But with figured stock, this practice becomes both wasteful and costly. Try these machining strategies:

Resaw to make the most of what you have.

Rather than plane figured stock, create thinner boards by resawing it, as shown at *left*. Use these boards to make wider pieces or create thick veneer. Make book-matched panels by edge-gluing the resawn pieces so the figured grain in one appears to reflect the other.

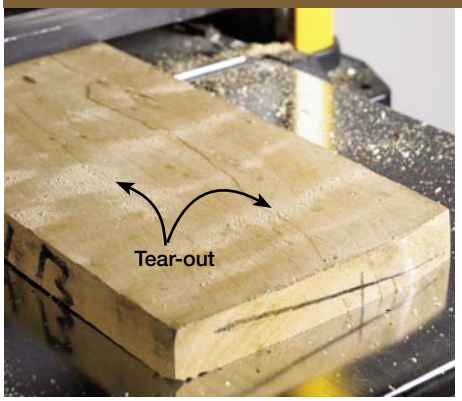
Resawing might seem intimidating, but it doesn't need to be. You can resaw 4"- to 6"-wide boards on any bandsaw. Here's how:

- Set the proper blade tension for the width of the blade you're using.
- Resaw scrap stock before slicing your figured wood to check your saw for blade drift. Adjust the fence/table angle as needed.
- Feed your stock slowly to prevent blade deflection. Don't force the cut—let the blade do the work.
- Increase blade tension or slow the feed rate if blade-tracking problems occur.
- If you plan to do much resawing, invest in a blade designed for the task: a ½"-wide version with three or four teeth per inch.

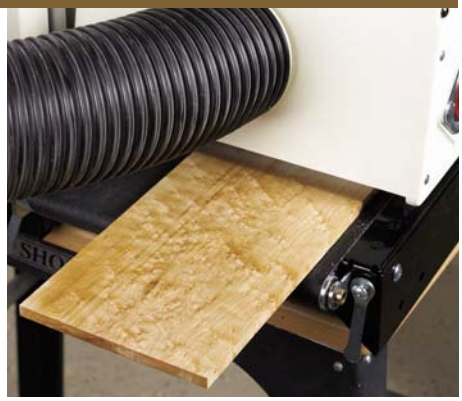
Drum sanders stop tear-out.

If you resaw your figured stock or buy it rough-sawn, you'll need to smooth the faces. Often wood fibers are oriented in opposing directions, though, so surfacing with a thickness planer may cause tear-out, *below left*. If you have access to one, a horizontal drum sander, *below center*, cleanly surfaces figured stock.

2 WAYS TO SURFACE FIGURED STOCK



To reduce tear-out when planing figured stock, remove 1/32" or less per pass, dampen the wood, or feed it the opposite direction.



A drum sander yields a tear-out-free surface. Be patient: Home-shop models can remove only about 1/64" per pass.

Use a clear finish to show off your figure

When coloring or topcoating figured wood, you don't want to obscure the grain patterns you've worked hard to highlight. Here's how to make sure that grain shines through.

Color enhances grain.

Color can really bring figured wood to life. As shown *above left*, dyes are preferred because the colors soak into the wood fibers. With pigmented stains, the pigments lie on the wood surface and obscure the dramatic grain.

Are there clear choices in clear finishes?

Whether colored or left natural, figured wood needs a protective topcoat. Our experiment, shown *above*, proves you can get good results using any of several clear finishes.

Written by **David Stone**

Good sources for figured wood:

Berea Hardwoods
877/736-5487; penkits.com
Gilmer Wood Company
888/667-3979; gilmerwood.com
Maple Leaf Hardwoods
570/584-5072; curlymaple.com
Sandy Pond Hardwoods
800/546-9663; figuredhardwoods.com
Steve Wall Lumber Company
800/633-4062; walllumber.com
West Penn Hardwoods
888/636-9663; westpennhardwoods.com
Woodworker's Source
800/423-2450; woodworkerssource.net

CROTCH Branch intersections in many species, such as walnut (shown), contain fibers that intersect in beautiful flame patterns. The best crotch figure occurs where a trunk divides into two equal-size branches.

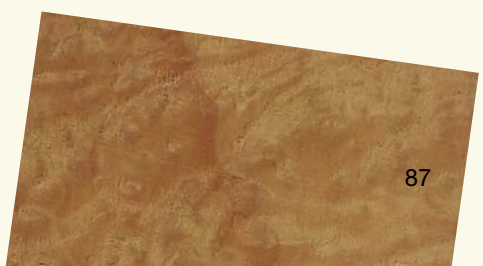
Price: $10+/bf (4/4) **Availability:** Fair

BIRDS-EYE Tightly swirling fibers sometimes form in trees, especially soft maple (shown). The highest-priced stock has many eyes that are spaced closely and consistently.

Price: $10+/bf (4/4) **Availability:** Fair

BURL Infections and disease sometimes cause bulbous growths to appear on the trunks and roots of many tree species. The fibers within grow in random swirling patterns, as seen in this elm burl.

Price: $5+/pound **Availability:** Fair



service-with-a-style nesting tray

The tapered trays stack compactly for space-saving storage.

Serve food and drinks or enjoy a laptop meal with this sleek, cork-lined carrier. The tapered ends make it easy to hold, and allow you to nest one tray in another.

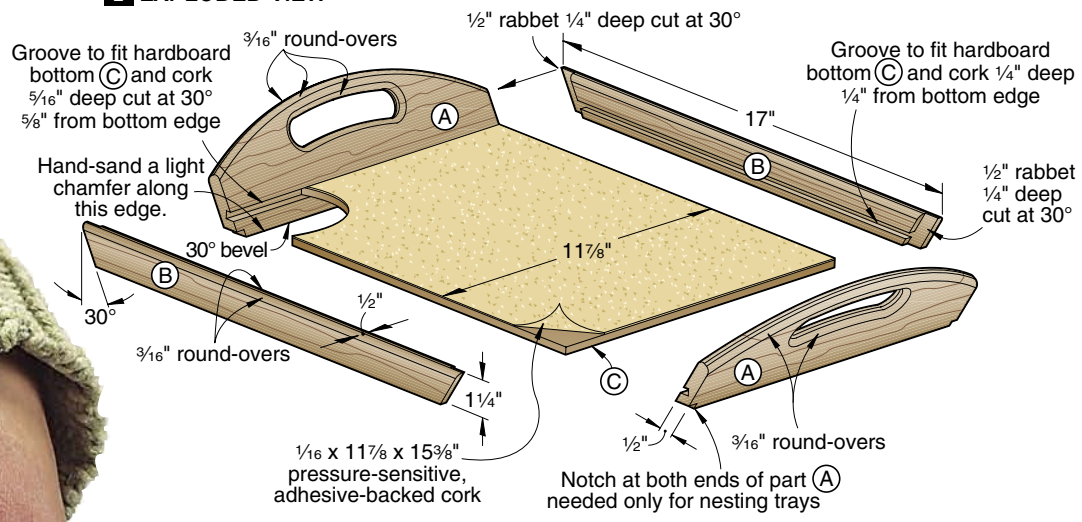
In just a couple of hours, and using only a small piece of walnut (or hardwood of your choice), hardboard, and adhesive-backed cork (see **Sources**), you can craft this all-purpose server. A full-size pattern makes forming the shapely ends a snap.

Start with the tray ends

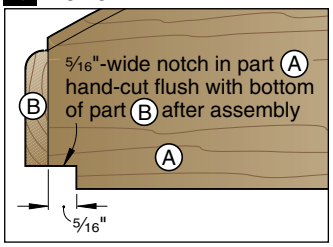
1 From ¾"-thick stock planed to ½" thick, cut two 4×11⅞" blanks for the tray ends (A). Make two copies of the full-size end pattern from the *WOOD Patterns®* insert. Spray-adhere the patterns to the *inside* face of each blank.

2 Measure the combined thickness of your ¼" hardboard for the tray bottom (C) and 1/16"-thick pressure-sensitive, adhesive-backed cork. (Ours measured about 9/32".) Then, to cut an angled groove in the tray ends (A) to receive the tray bottom and cork, where shown on the pattern and **Drawing 1**, fit your tablesaw with a dado blade that matches the measured thickness. Tilt the blade 30° from vertical. Now, referring to

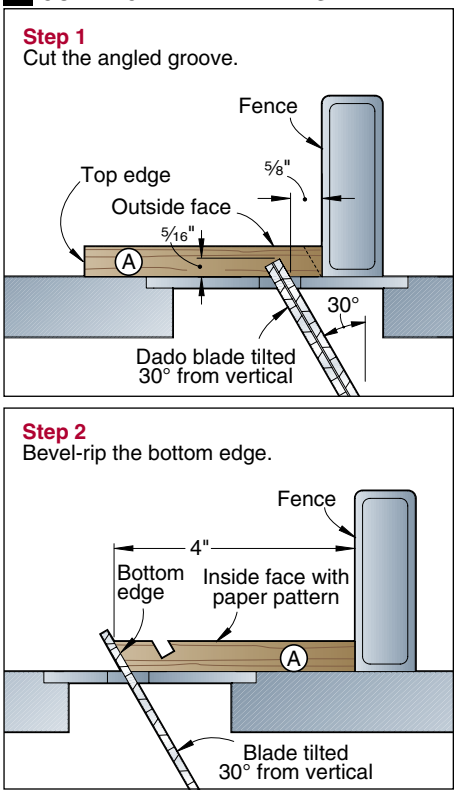
1 EXPLODED VIEW


Groove to fit hardboard bottom (C) and cork 5/16" deep cut at 30° 5/8" from bottom edge
3/16" round-overs
1/2" rabbet 1/4" deep cut at 30°
Groove to fit hardboard bottom (C) and cork 1/4" deep 1/4" from bottom edge
17"
1/2" rabbet 1/4" deep cut at 30°
Hand-sand a light chamfer along this edge.
30° bevel
11 7/8"
30°
1/2"
3/16" round-overs
1 1/4"
1/16 x 11 7/8 x 15 3/8" pressure-sensitive, adhesive-backed cork
1/2"
3/16" round-overs
Notch at both ends of part (A) needed only for nesting trays

1a NOTCH DETAIL END VIEW



2 CUTTING THE TRAY ENDS



Drawing 2, Step 1, for setup, cut a 5/16"-deep groove 5/8" from the bottom edge of each end piece on the *inside* face.

3 Refit your tablesaw with a standard blade, again tilted 30° from vertical. Referring to **Drawing 2**, Step 2, for setup, bevel-rip the bottom edge of the end pieces (A).

4 To form the handle openings in the end pieces, chuck a 1" Forstner bit in your drill press. Then bore two holes through each end piece at the two centerpoints, where shown on the patterns. Now, using your scrollsaw with a #2 reverse-tooth blade, cut along the inside edge of the pattern lines to complete the openings. Sand the openings smooth with a 3/4"-diameter sanding drum.

5 To complete the end pieces, bandsaw the curved top edge to shape, cutting close to the pattern line. Then sand to the line. Next, using a 3/16" round-over bit in your table-mounted router, rout round-overs along the top edge and handle opening, where shown on the pattern and **Drawing 1**. Now hand-sand a light chamfer along the *inside* of the beveled bottom edge, where shown. Remove the patterns using a cloth moistened with paint thinner.

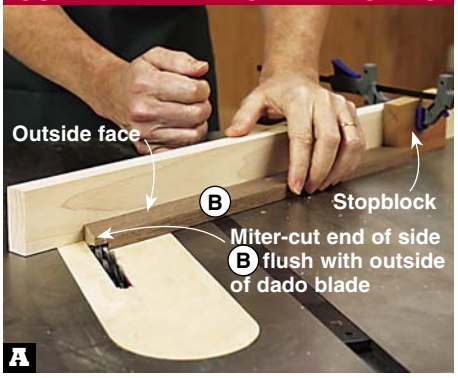
On to the tray sides/bottom

1 From 3/4"-thick stock planed to 1/2" thick, cut the tray sides (B) to the size listed in the **Materials List**. To cut the opposing 30° mitered ends on the side pieces, where shown on **Drawing 1**, attach an auxiliary extension with a stopblock to your tablesaw miter gauge. Angle the gauge to 30°. Then miter-cut one end of a side piece, flip the piece end-for-end, and miter-cut the other end. Repeat for the other side piece.

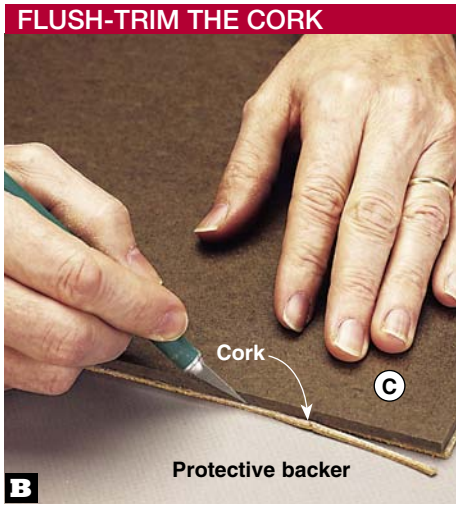
2 To cut angled 1/2" rabbets 1/4" deep along the mitered ends of the side pieces on the *inside* faces, where shown on **Drawing 1**, refit your tablesaw with a 1/2" dado blade. With your miter gauge still angled at 30° and the stopblock repositioned as needed, cut a rabbet along one end of each side piece, as shown in **Photo A**. Next, switch your miter gauge to the slot on the other side of the dado blade, and angle the gauge to 30° in the opposite direction. Reposition the auxiliary extension and stopblock. Now cut the rabbets on the other ends of the pieces.

3 Refit your tablesaw with a dado blade that matches the width of the grooves

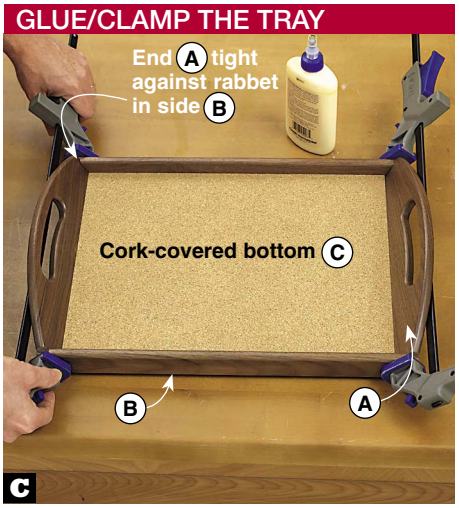
CUT THE RABBETS IN THE SIDES



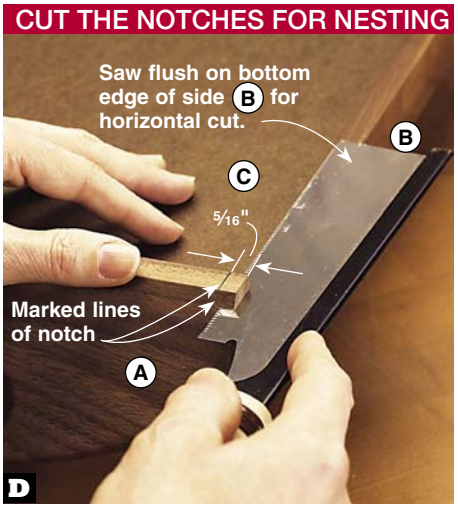
With the miter-cut end of the side (B) aligned with the outside of the dado blade, cut a 1/2" rabbet 1/4" deep angled across the *inside* face.



With the bottom (C) cork-side down on a protective backer, trim the cork flush with the edges of the bottom using a crafts knife.



Make sure the ends (A) fit tight against the rabbets in the sides (B). Then clamp the sides together to hold the ends in position.



Using a fine-tooth saw, make a horizontal cut and then a vertical cut along the marked lines to form a 5/16"-wide notch in the ends (A).

you cut in the tray ends (A). Then cut a ¼"-deep groove ¼" from the bottom edge of each side (B) on the *inside* face, where shown. Now rout 3/16" round-overs along the top edges of the side pieces.

4 From ¼" hardboard, cut the bottom (C) to 11⅞×15⅜". Then, from a 1/16×24×36" sheet of pressure-sensitive, adhesive-backed cork, cut a 12×15½" piece using a sharp crafts knife. (If you wish to make additional trays, there's enough cork for four. Just make sure you cut the 12" width carefully.) Place the cork on a flat surface with the adhesive side up, and remove the protective backing. Center and press the hardboard bottom on the cork. Turn the bottom over, and firmly adhere the cork using a 3" rubber J roller. Now, trim the cork, as shown in **Photo B**.

Cork: a great tray surface

When designing this project, we considered several surfaces for the tray. We settled on cork because it prevents serving utensils from sliding about, and, as we discovered, it cleans easily. In the event of a spill, simply wipe it up with a damp sponge, adding a small amount of mild, liquid soap, if needed. A waxy, waterproof substance in the tissue lining of cork prevents penetration of liquids. Sound too good to be true? To find out, I smeared a nasty blob of ketchup and spilled an ounce of red wine on a piece of cork and let them sit for 30 minutes. Amazingly, they cleaned up easily, and left no sign of discoloration behind.

Owen Duvall
Projects Editor

Finish up

1 Dry-assemble the tray ends (A), sides (B), and bottom (C), and check that the parts fit together correctly. Then disassemble, and make any needed adjustments.

2 Finish-sand the ends (A) and sides (B) to 220 grit, and remove the dust.

3 To prevent getting finish on the glue-joint areas, mask the ends of ends A and the rabbets in sides B with easy-release painter's tape. (We found it better to finish the parts before assembly, which avoids getting finish on the tray-bottom cork.) Then, from scrap, cut strips to snugly fit the grooves in the ends and sides. Press the strips into the grooves.

4 Apply two coats of a clear finish to the ends (A) and sides (B). (We applied Varathane Diamond Wood Finish, semi-gloss, sanding to 220 grit between coats.) After the finish dries, remove the masking tape and hardboard strips.

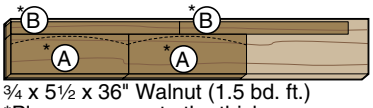
5 Apply glue to the rabbets in the sides (B). Also, apply a small amount of glue in the grooves in these parts and the tray ends. Assemble the tray with the bottom (C), cork side up, captured in the grooves in the ends and sides. Check for tight joints and then clamp the tray together, as shown in **Photo C**.

6 If you plan to make more than one tray and want them to nest together, lay out a 5/16"-wide notch in the bottom corners of the ends (A), where shown on **Drawings 1** and **1a**. Place the tray on support blocks with the bottom up. Then cut the notches, as shown in **Photo D**. (The notches provide clearance so the trays will fit together with the side members flush.)

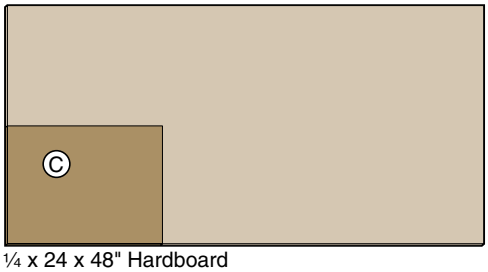
7 Finally, apply finish to the small exposed areas of the ends (A) above the sides (B), and to any notches you cut in the end pieces. After the finish dries, take the tray to the kitchen, rustle up some snacks and drinks, and put your masterpiece into service.

Written by **Owen Duvall** with **Erv Roberts**
Project design: **Kevin Boyle**
Illustrations: **Roxanne LeMoine**

Cutting Diagram



¾ x 5½ x 36" Walnut (1.5 bd. ft.)
*Plane or resaw to the thickness listed in the Materials List.



¼ x 24 x 48" Hardboard

Materials List (parts for one tray)

Part		FINISHED SIZE T	W	L	Matl.	Qty.
A*	ends	½"	3⅞"	11⅞"	W	2
B	sides	½"	1¼"	17"	W	2
C	bottom	¼"	11⅞"	15⅜"	H	1

*Part initially cut oversize. See the instructions.
Materials key: W–walnut, H–hardboard.
Supplies: Spray adhesive, easy-release painter's tape.
Blades and bits: Dado-blade set, 1" Forstner bit, #2 reverse-tooth scrollsaw blade, 3/16" round-over router bit.

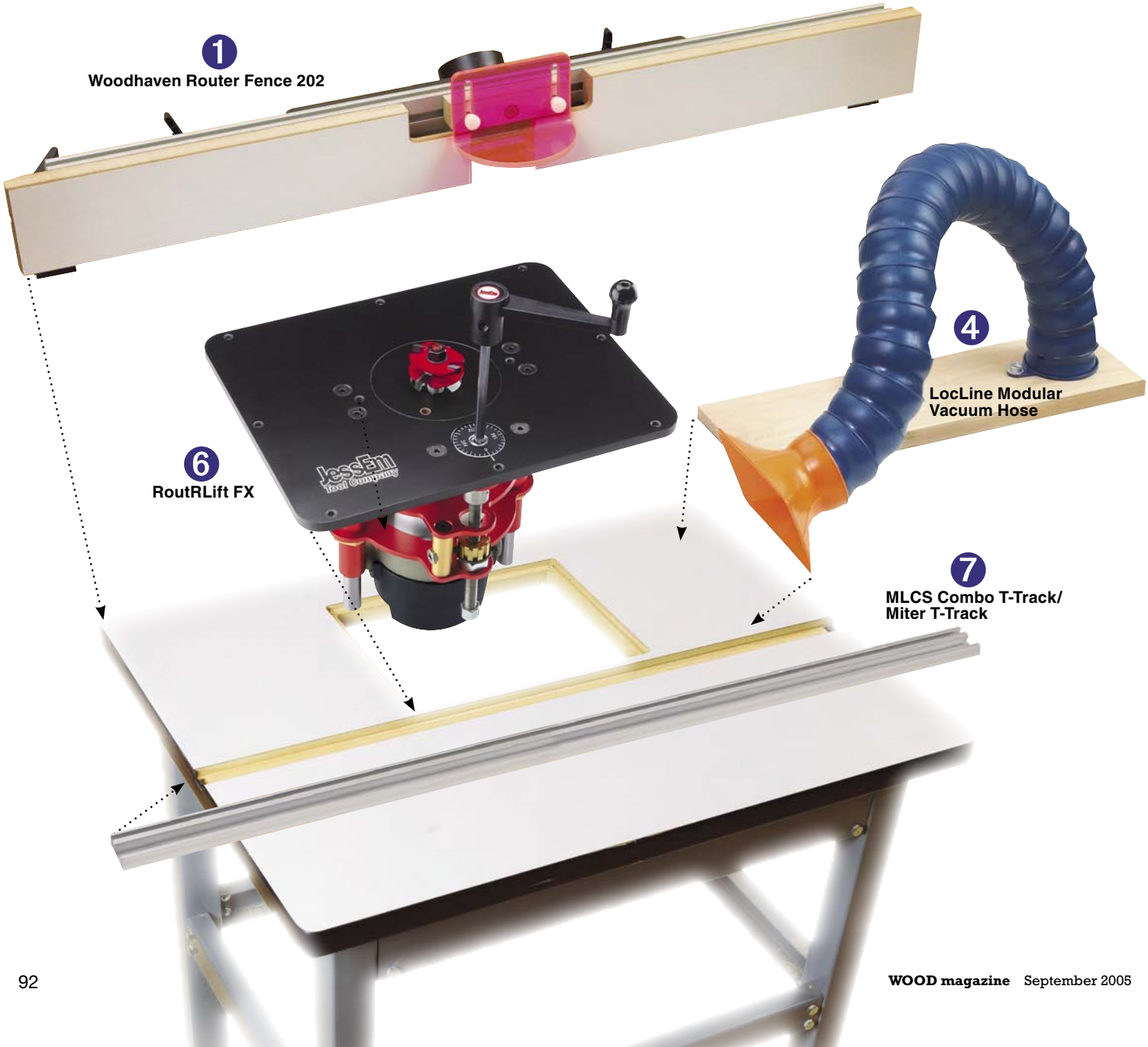
Sources

Cork: 1/16x24x36" pressure-sensitive, adhesive-backed cork, $13 plus shipping. Call or click The Corkstore, 800/959-0995; corkstore.com.

12 GREAT router-table upgrades

We tested more than 50 router-table accessories—here's the best of the bunch.

We love our router tables. Perhaps that's why woodworking catalogs and Web sites offer more accessories for routers and router tables than any other tool besides tablesaws. The challenge is in determining which add-ons are merely cool (and seldom used) and which ones really make life in the shop easier. Here are the dozen we found almost indispensable.



FENCE FAVORITES

❶ Woodhaven Router Fence

You can buy more elaborate router-table fences, but we think this one (shown at *left*) provides great versatility at a moderate price. Independently adjustable MDF fence faces slide in and out and can be cut away for zero-clearance routing; shims (included) step out the outfeed fence for jointing. The fence clamps to the edges of the tabletop (so you don't need to drill holes or cut slots into the table) and installs on any router table from 21" to 32" wide and up to 1⅝" thick.

Price: $140 (model 202)
800/344-6657, woodhaven.com

❷ Board Buddies

You can use feather boards to hold a workpiece down and more feather boards to hold it against the fence, but one pair of yellow Board Buddies does all that and more. They hold stock down, pull it against the fence, prevent kickback (the wheels turn in only one direction), and keep your fingers out of harm's way. Installed on your fence's top (we mounted them in T-track), Board Buddies adjust for stock thickness and roller pressure. And they provide the same benefits when switched over to your tablesaw fence. One small limitation: Buddies can't handle workpieces less than about 1" wide.

Price: $50 (item no. W1104)
800/840-8420, shopfox.biz

❸ PanelLoc

Simple, yet elegant, PanelLoc adds both safety and accuracy when working with large-diameter bits, such as panel raisers. Completely covering the bit, PanelLoc prevents fingers or hands from getting anywhere near the cutting edges. Meanwhile, it also acts as a stock hold-down, keeping consistent downward pressure on the workpiece. (Panels must be at least 6" wide to work with the device.) Beveled edges at both ends of the aluminum extrusion ease workpiece entry and exit without marring. You can bolt it onto your fence face or in ¼" T-track.

Price: $55 (model 40-025)
800/786-8902, benchdog.com

TABLETOP TALENT

❹ LocLine Modular Vacuum Hose

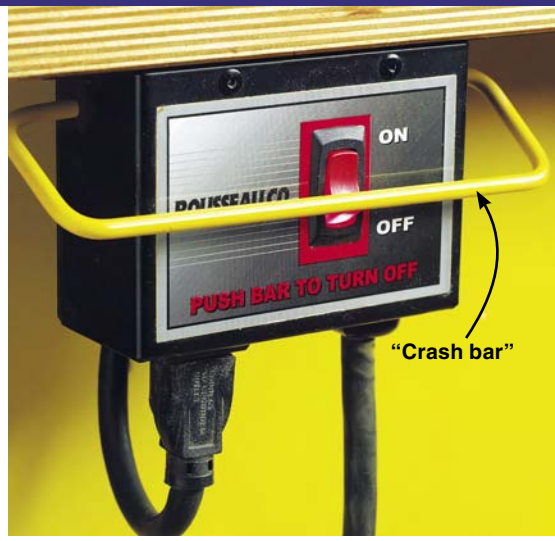
How do you catch dust when routing free-hand? LocLine bends, twists, and can be lengthened or shortened (by adding or removing hose segments) to put the inlet in the best chip-collecting position. You can install it permanently, but we opted to mount LocLine's Shop-Vacuum Hose Adapter with Mounting Tab to a piece of scrap (as shown in the photo at *left*) that we clamp to the router table when we need it, or move it to other dust-producing tools, such as the drill press or scrollsaw.

Price: 2½" hose, $14 per foot; 3½×6" rectangular nozzle, $5; shop vacuum adapter with mounting tab, $4
800/423-1625, locline.com

❺ Rousseau Power Switch

Fumbling under your router table to find the tool's on-off switch is not only frustrating, it can be downright dangerous. That's why we strongly suggest adding a remote start switch. We like the simplicity and safety of Rousseau's Power Switch: It sports a bright yellow "crash bar" that's easy to find should you get in trouble with a cut. And the lighted toggle switch lets you know when its three-prong grounded outlet is hot before plugging your router into it. The switch mounts only to an overhang, as shown; if we could improve one thing, we'd add a way to install it on the side or face of the router-table cabinet.

Price: $35 (Model 3506)
800/635-3416, rousseauco.com



❻ RoutRLift FX router lift

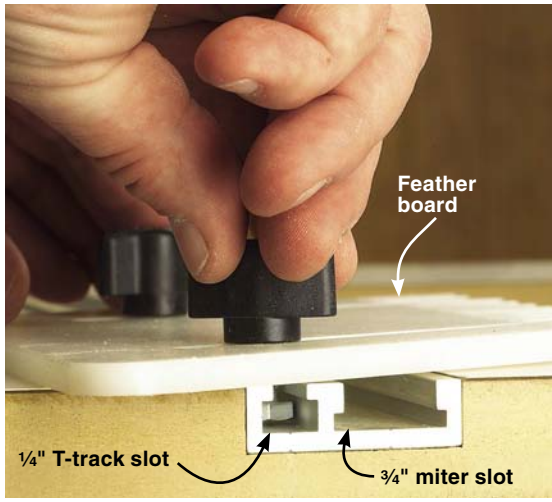
You can take your pick from at least a dozen router lifts (devices that let you adjust bit height and even change bits from above the table) ranging from $150 to nearly $400, each fitting a different group, size, or style of router. So, your choice may be limited to one or two models that fit your router. We like JessEm's RoutRLift FX (shown at *left*) because it readily accepts motors from the most common midsize routers: the Bosch 1617 and 1618 series, DeWalt DW610 and 618 series, and Porter-Cable 690 and 890 series. To reclaim the router for handheld use, a simple cam lock releases the motor. The insert plate measures 9¼×11¾".

Price: $180
866/272-7492, jessem.com

❼ Combo T-Track/ Miter T-Track

Some accessories, such as a feather board, miter gauge, or box-joint jig, work on both router tables and tablesaws. Combo T-Track/Miter T-Track provides side-by-side slots—one for ¾" miter bars, and the other for ¼" T-track accessories—so it fits miter-bar-guided jigs and T-bolts, such as those often found on feather boards. (The T-shaped miter slot eliminates removing a miter gauge's washer, as you would do with a simple dado in the tabletop.) This two-way track works best in tabletops at least 1" thick: The 7/16"-deep slot needed to install the track can weaken a thin tabletop.

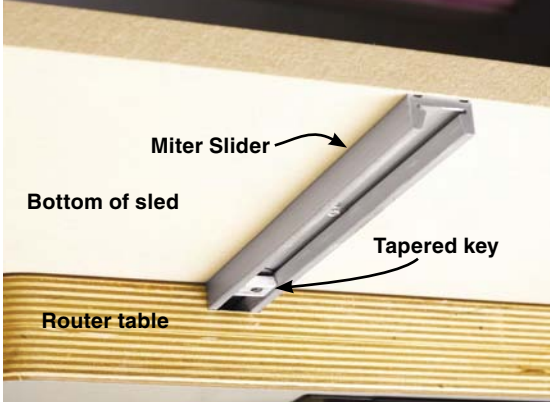
Price: $25 (32" length, item no. 9859)
800/533-9298, mlcswoodworking.com



❽ Miter Sliders

Miter-bar-guided jigs, such as coping sleds and tenoning jigs, demand a perfect fit between the miter bar and the table slot. The tapered key in Incra's Miter Sliders expands the bar for a custom fit to almost any ⅜×¾" miter slot. The concept isn't new: Many tablesaw miter gauges now feature expandable miter bars, but fitting them can be tedious because the adjustment screws are on the bottom. Incra solved that, too. By drilling a couple of holes through your jig before installing Miter Sliders, you access the adjustment screws from the top. This also allows you to lock the bar tight in the slot for fixtures, such as a feather board or stock hold-down.

Price: $15 (18" length); $20 (24" length)
972/242-9975, incra.biz

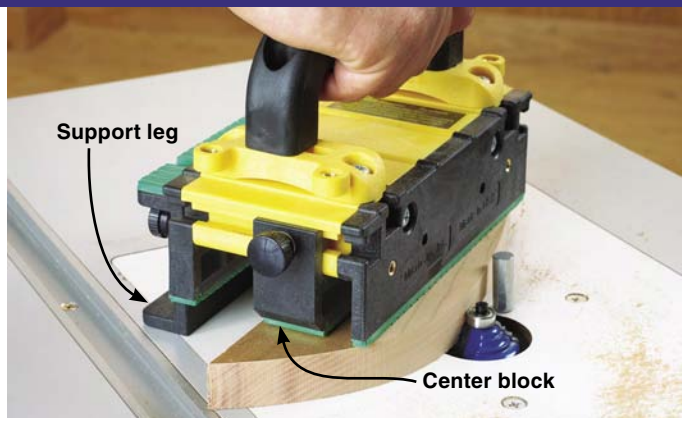


HANDY HELPERS

❾ GRR-ripper System

Looking for the ultimate pushblock for your shop? Rubber pads on the bottom of the GRR-ripper tenaciously hold a workpiece so you can press it firmly to the table, and its beefy top-mounted handle provides a wide safety zone for your hand. We especially like this device when pattern- or template-routing with a starter pin and bearing-guided router bit. The support leg adjusts to the workpiece thickness, or flips top-to-bottom to add even more gripping surface. The GRR-ripper works even better on the tablesaw: By sliding the center block left or right you create a tunnel for the saw blade to pass harmlessly through, allowing you to rip stock as narrow as ¼" without losing contact with the workpiece.

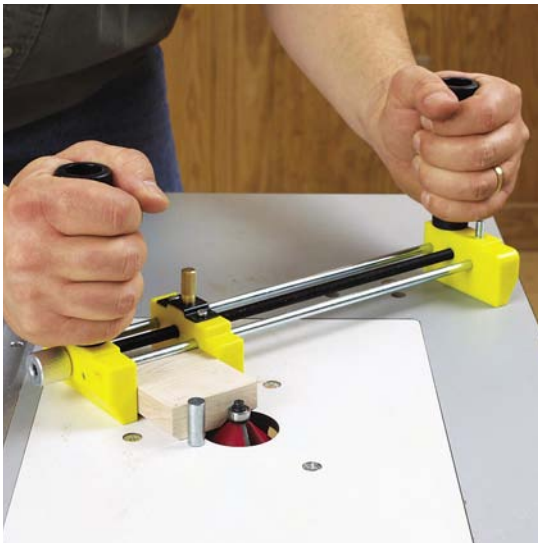
Price: $50 (model GR100)
407/696-6695, microjig.com



❿ The Finger Saver

If freehand routing a chamfer or round-over on small parts sets off warning bells inside your head, answer the alarm with The Finger Saver. Clamp any part shorter or narrower than 10" between the jaws of this workholder, and then use the large handles to keep your fingers well clear of the bit. A quick-release mechanism makes resizing for various workpieces fast and easy. The Finger Saver comes with an attached angle guide for mitering, but we saw little value in it, so we removed it.

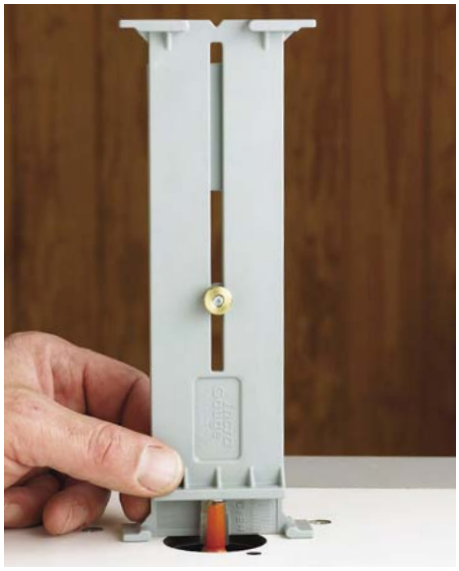
Price: $20 (part no. 420-1010)
800/872-2511,
eagle-america.com



⓫ Incra Gauge

We've tried a lot of fancy bit-height gauges, but keep coming back to the accurate simplicity of the Incra Gauge. First, set the gauge to the desired depth (it locks in at precise 1/32" increments), and then raise the bit until it touches the overhanging jaw. We find it much easier and more accurate than any ruler. The Incra Gauge fits nicely in an apron pocket, or can be tossed into a drawer without fear of losing its calibration. Elsewhere in the shop, it can do duty as a marking gauge or for setting the blade height on your tablesaw.

Price: $16 (item no. IG32)
972/242-9975, incra.biz



⓬ Bit Holders

We've seen all kinds of router-bit storage, but the Bit Holders from Lee Valley received a unanimous thumbs-up from our staff. Available for ¼"- and ½"-shank bits, they install simply with a ⅝"-long screw through the bottom, and grip equally well whether mounted vertically or horizontally. And, unlike prefabricated racks, you install them in whatever configuration fits your space. We mounted a single Bit Holder on top of our fence to keep track of one half of the rail-and-stile set while we work with the other.

Price: $2.50 (six holders for ½" bits, item no. 16J03.62); $1.50 (six holders for ¼" bits, item no. 16J03.61)
800/267-8735, leevalley.com

easy-slider laminate press

Why buy a laminate roller when you can make a laminate press from scrap found in your shop?

Contact adhesive grabs fast and holds tight, so when adhering plastic laminate to a top, you must make sure the surfaces don't touch until they're properly aligned. But after contact, merely smoothing the laminate with your hands isn't enough to apply even pressure and ensure a long-lasting bond. You can buy a hand-held laminate roller from woodworking specialty stores and catalogs for $15–$40 to do the job. But for woodworkers who only occasionally apply such a top, this shop-made tool performs just as well for a lot less money.

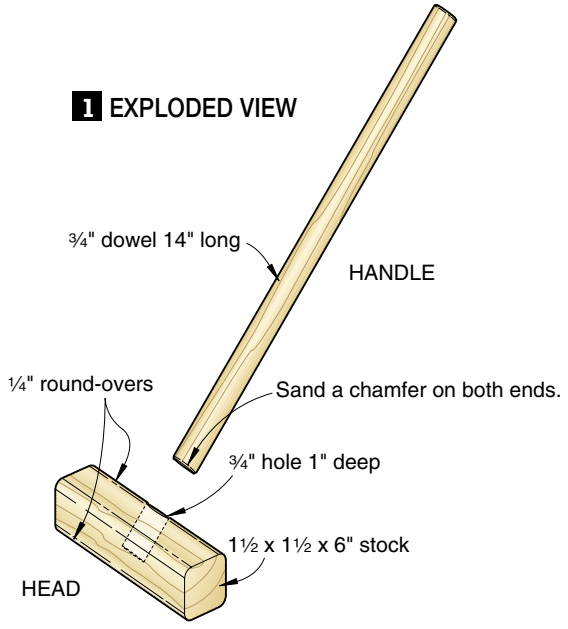
To make the press, simply cut a 1½×1½×6" block for the head and rout ¼" round-overs along the edges, where shown on **Drawing 1**. Holding the head in a V-block, where shown on **Drawing 2**, chuck a ¾" Forstner bit into your drill press, and bore a 1"-deep hole. Sand the head smooth. Then cut a 14" length of ¾" dowel for the handle, sand chamfers on both ends, and glue it into the head.

Give the tool a try

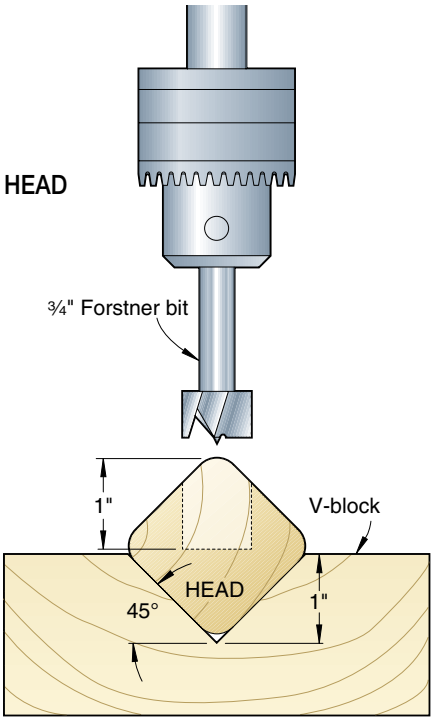
To use the press, apply pressure with the head, as shown in the photo *above*. Work from the center to the edges to force out any trapped air. To avoid accidentally breaking off the untrimmed laminate, stay away from the edges. With the center bonded, make a few passes parallel to the edges of the top. Then, after trimming the laminate with your router, press down the corners.

Project design: **Chuck Hedlund**

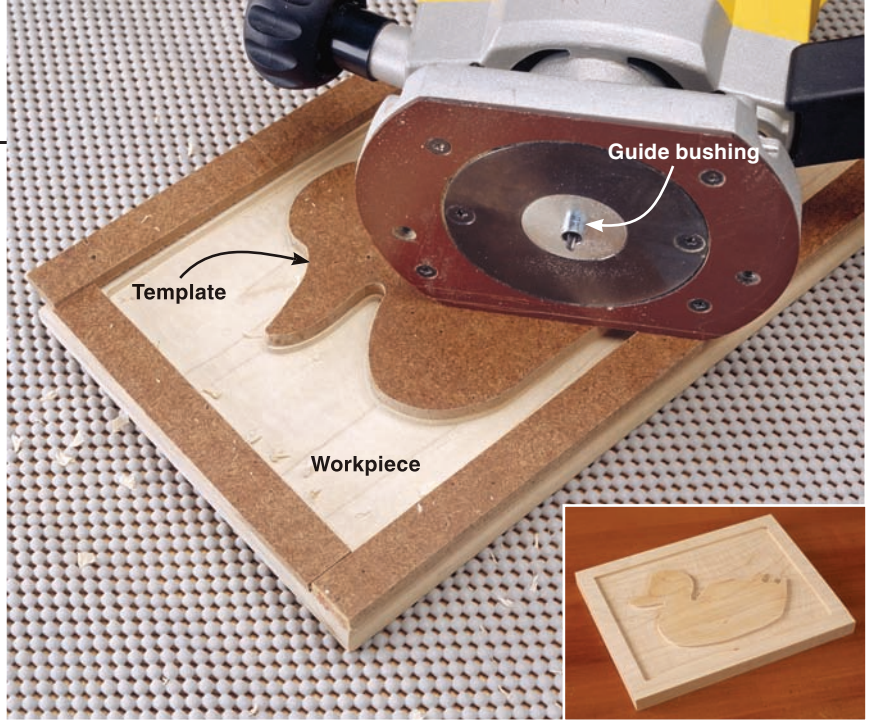
1 EXPLODED VIEW



2 BORING THE HEAD



understanding guide bushings



Guide bushings may be the most misunderstood of all router accessories. Their uses include cutting dovetails with a jig, lettering, inlay work, even reproducing furniture parts.

Here's the basic concept: A guide bushing mounts to the router's subbase with a tube that protrudes below. A straight router bit extends through the tube. The outer surface of the tube rides against an edge guide or template, keeping the bit a set distance (offset) from the edge guide or template.

What's available

In the marketplace you'll find two bushing styles. The Porter-Cable two-piece (shown at *right*) uses a screw-on locking ring to hold the tube part to the router base. This style fits a wide range of models. The other style of guide bushing clicks into place, but only fits Bosch routers. If your router doesn't accept these common styles of guide bushings, consider buying adapters and subbases (see **Sources** *below right*). Guide bushings are sold individually or in sets. Individual bushings cost $6–$8 each, while sets range from $30–$45.

Two-piece/ Porter-Cable style

Click/ Bosch drop-in style

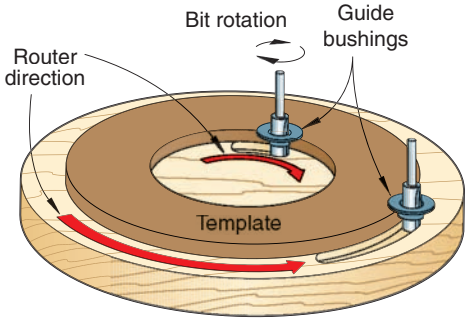
Guide-bushing how-to

To use a guide bushing, you need an edge guide or template to follow. You'll want to size the template slightly larger or smaller than the workpiece. (See "How to figure guide bushing and template offset," *below*.) Templates can be made of just about any material, but we prefer ¼" hardboard.

To make a template, simply affix your drawing or pattern to the template material with spray adhesive, and then bandsaw or scrollsaw it to shape. After completing the cut, file or sand-smooth any irregularities or rough spots on the template edges.

Attach the template to your workpiece with a few drops of hot-melt glue or double-faced tape. Use a router pad to hold your workpiece in place on your bench while you rout. If you are going to rout completely through the workpiece, attach a backer to protect the router pad and benchtop.

Using a straight bit that fits through the guide bushing, rout out the waste area surrounding the template. Remember to rout counterclockwise when cutting around the outer edge of a template, and clockwise when routing the inside. (See the **Drawing** *below*.) Once you're finished routing, gently separate the template from the workpiece with a chisel.



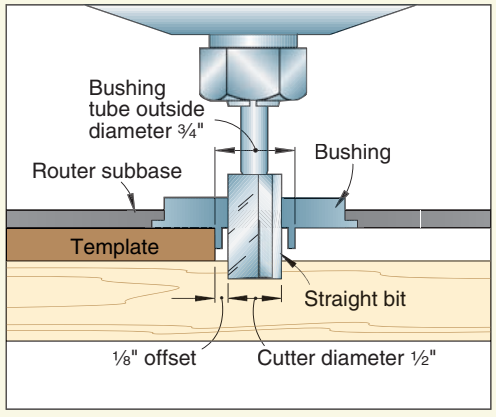
Know your alternatives

There are router bits capable of template routing without guide bushings. See the chart on *page 99* for comparison information.

How to figure guide bushing and template offset

Offset is the distance from the outside of the guide bushing tube to the cutting edge of the router bit. This dimension determines where the bit cuts the workpiece.

To figure the offset, measure the outside diameter (OD) of the guide bushing tube and subtract the diameter of the bit. Next, divide this figure by 2 to determine the offset. In the example at *right*, subtract the ½" bit diameter from the bushing's ¾" OD. You get ¼". Now divide this number by two and you arrive at a ⅛" offset.



Sources

Adapters and subbases are available from many mail-order sources, including the following:

- Eagle America, 800/872-2511 or eagle-america.com
- Lee Valley Tools, 800/871-8158 or leevalley.com
- Rockler Woodworking and Hardware, 800/279-4441 or rockler.com

TWO ALTERNATIVES TO GUIDE BUSHINGS AND STRAIGHT BITS

You can skip using a guide bushing altogether if you use a pattern bit or flush-trim bit. Both types have a bearing that rides against the template, just as a bushing does. But because the bit cuts flush with the bearing, you don't have to calculate offset.

SETUP	PROS	CONS
Pattern bit	■ Plunge cuts are possible. ■ Can substitute for straight bits. ■ Template hole and workpiece hole are the same size.	■ Bit deflection is more prevalent with small-diameter bits. ■ Full cutting length is exposed when using thin templates.
Flush-trim bit	■ Works well in a router table or handheld router. ■ Only needed cutter length is exposed. ■ Template hole and workpiece hole are the same size.	■ Cuts are always full depth of the workpiece. ■ Can't make plunge cuts.
Guide bushing and straight bit	■ Plunge cuts are possible. ■ Can use multiple bits with same bushing. ■ Both shallow cuts and deep cuts are possible.	■ Hole in template must be larger than hole in workpiece. ■ Can't duplicate parts exactly.

shop-proven products

These woodworking wares passed our shop trials.

Drill and drive around corners with Orbiter

No matter how well I plan my projects, there are times when I need to drill a hole or drive a screw in a place too cramped to fit an ordinary drill. Because this doesn't happen often, I can't justify buying a dedicated right-angle drill. That's why Orbiter brings a new twist to my drilling and driving arsenal.

Unlike a right-angle drill or right-angle drilling accessory, Orbiter puts the bit at any angle between 0° and 90° from the drill chuck. Both halves of the spherical gear case rotate independently of one another to accomplish this nifty trick. That gear case also adds bulk, so Orbiter can't get into the really tight spaces that a right-angle drill or 90°-only accessory can.

Still, it's versatile and easy to use. Simply mount the hex-shank driveshaft into your drill's chuck and a bit into Orbiter's ⅜" keyless chuck. Twist the handle to release the angle-locking mechanism, rotate the halves and handle into the best position for the task, and then twist the handle again to lock in the angle.

Because of the light weight and moderate price of Orbiter, I wanted to challenge the tool's ability. So I bored ten ½" holes through a 2×4 stood on edge (changing the angle between every hole) with no problem.

Orbiter

Performance	★★★★☆
Price	$30

Milescraft
815/874-2400; milescraft.com

Next, I switched to a ⅜" bit and drilled 100 holes through the same 2×4 in rapid succession, changing angles at random. Orbiter didn't miss a beat. And, although it got a little warm, it performed like a star.

—Tested by Dean Fiene

Dadonator stacked dado set cuts smooth and square

Most stacked dado sets come equipped with two-tooth chippers (the winged "blades" that sandwich between the two outside blades). A few dado sets sport four-tooth chippers for better balance and a smooth-bottomed cut. Why? Because doubling the number of teeth results in twice as many cuts per rotation of the blade. The chippers on the Dadonator 8" stacked dado set from Infinity Cutting Tools have six—count 'em—six teeth.

The added teeth make a difference in a couple of ways: First, each chipper removes a smaller wood chip, so I found that I could feed my workpieces faster than with two-tooth chippers. And, although I can't prove it, it stands to reason that dividing the cutting load over three times as many teeth should keep the teeth sharp three times longer than two-tooth chippers. After months of use, the Dadonator still cuts flat, square-bottomed dadoes with little or no tear-out, even in oak-veneer plywood.

Infinity added a couple of other nice touches to this set. For example, each chipper bears a stamp showing how much width it adds to the stack, and a chart that comes with the set shows exactly which combination of chippers yields any dado width from ¼" to 29/32" in 1/32" increments.

The Dadonator also comes with color-coded plastic shims for fine-tuning the cutting width. I just wish those shims were marked with their thickness, so I wouldn't have to look it up each time.

—Tested by Larry Arnold

Dadonator 8" stacked dado set (#sdb-800)

Performance	★★★★★
Price	$180

Infinity Cutting Tools
877/872-2487; infinitytools.com

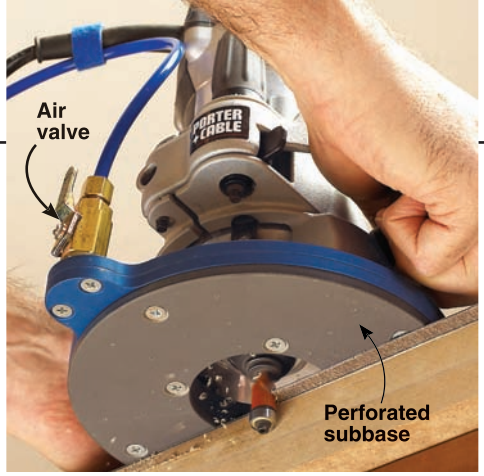
continued on page 102

Air-Glide cuts friction on smooth surfaces

In the Air Hockey arcade game, the puck floats virtually friction-free on a cushion of air blown through hundreds of holes on the game table's surface. It's the same principal behind Betterley Industries' Air-Glide Router Base and it works amazingly well on some materials. Designed primarily to reduce scratching when routing easily marred surfaces, such as plastic laminate and solid-surface materials, it also reduces operator fatigue on supersmooth materials.

Replace your router's subbase with the aluminum Air-Glide—it fits most routers with 6" and 7" bases; see Betterley's Web site for exact models—and hook its 10' air hose to your compressor. (My 4-gallon compressor ran constantly while I used Air-Glide.) The compressed air blows through tiny holes in the phenolic subbase, lifting the router an imperceptible .0001" off your workpiece. On solid-surface, smooth plastic laminate, and melamine, I was delighted at how easily the router glided when routing an edge treatment or a rabbet.

It doesn't work as well on all surfaces, though. On porous and open-grained woods, such as oak and oak plywood, sanded to 150 grit, the friction-reducing benefit of Air-Glide all but disappeared. I had to sand the plywood to 320 grit (and who wants to do *that*?) before it glided like it does on smooth plastic laminate. Even laminates with light texture reduced the air-cushion effect.



Bottom line: Pros who work with countertops all day every day will love Air-Glide. Home woodworkers may not use it enough to justify the cost.

—Tested by John Cebuhar

Air-Glide Router Base (AG-7000)

Performance	★★★★☆
Price	$150

Betterley Industries, Inc.
800/871-7516; betterleytools.com

All your safety supplies in one spot

Since my doctor told me that I'd lost about 15 percent of my hearing (largely from working around power tools without hearing protection), I've been more careful to preserve what hearing I have left, as well as my vision. Safetypaq makes the job easier with a case of personal safety gear that includes indoor and tinted outdoor safety glasses, lightweight ear plugs, and leather-palmed work gloves.

Although I typically wear earmuff-type hearing protection, the soft, finned ear plugs are so comfortable I forgot I had them in after a few minutes. Same with the wraparound safety glasses, which provide a wide, distortion-free view of my woodworking world. Each pair of glasses comes with a protective cloth bag to prevent scratching.

Safetypaq's sleek plastic storage container keeps dust and debris at bay, and its clear cover lets me see what's in the case before I reach for it. The case can hang on a peg hook, but thanks to magnets mounted on the case back, I keep mine stuck to the side of my tablesaw where it's always handy.

—Tested by Dave Campbell

Safetypaq safety kit

Performance	★★★★★
Price	$37 (ppd.)

Dynapaq
800/559-0491; dynapaq.com

what's ahead

Your special preview of the October issue (on sale August 30)

Projects big and small

FEATURED PROJECT

Entertainment center

Despite its compact dimensions (23¾" deep × 44" long × 26" high), this piece accommodates a big-screen TV and hundreds of videos and CDs, with room for your supporting electronic gear.

Jewelry box

Make someone's day by presenting them with this stunning piece. You'll find a handy source for the quilted maple and wengé used in its construction.

Young artist's easel

With a 150' roll of paper replenishing the drawing surface on one side, and a chalkboard on the other, this easel will keep your little Picasso engaged for hours.

Traditional bookcase

A weekend is all you need to build this elegant yet simply constructed beauty. You can purchase the legs or turn them yourself using the full-size pattern.

Tools and techniques

TOOL TEST

Clamp-on tool guides

These handy shop aids make quick and accurate work of routing or sawing large workpieces. We test eight models priced from $58 to $240.

Eliminate tear-out

Learn the tricks that stop splintering in its tracks whenever you saw, rout, or drill.

Dovetail lap joint

Dress up and strengthen wood frames with this easy-to-make reinforcement.

Guide to building projects

Use these 10 shop-savvy tips to build flawless furniture pieces every time.

Better Homes and Gardens® WOOD® magazine (ISSN-0743-894X) is published seven times a year in February/March, April/May, June/July, September, October, November, and December/January by Meredith Corporation, 1716 Locust St., Des Moines, IA 50309-3023. For subscription questions call 800/374-9663. Outside the U.S., call 515/247-2981. Periodicals postage paid at Des Moines, Iowa, and additional mailing offices. Better Homes and Gardens trademark registered in Canada and Australia. Marca Registrada en México. One-year subscription prices: U.S. and its possessions, $28; Canada, $41; other countries, $49. Canada Post Publications Mail Sales Product Agreement No. 40069223. Canadian BN 12348 2887 RT. CANADIAN RETURN ADDRESS: Better Homes and Gardens WOOD magazine, 2744 Edna Street, Windsor, Ontario, N8Y 1V2. POSTMASTER: Send address changes to Better Homes and Gardens WOOD magazine, P.O. Box 37439, Boone, IA 50037-0439.